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CHEMICAL AGE

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SCIENCE AND POLITICS

IS THERE an appropriate place for the scientist in politics? Do scientists write off the politician as someone before whom scientific pearls are cast in vain because he is too concerned with what is popular to busy himself with what is right? The relation between science and politics and the place that the scientist has to fill in politics were considered by Sir Hugh Linstead, MP for Putney in the 5th Bernard Dyer Memorial Lecture delivered on 26 February to the Society for Analytical Chemistry.

Sir Hugh suggests that the scientist's approach to problems in which science and politics are inextricably mixed, is simple and direct and his method deductive, unlike that of the politician who proceeds inductively and considers always in his approach the incalculable element of the reactions of human beings. Examples are given to show how politics blunt the edge of science, with one exception where the reverse process—of politics driving science—is illustrated today in Israel.

Of the very much up-to-the-minute problem—that of nuclear energy, where politics and science interlock so closely—Sir Hugh says it is right that there should be intense concern regarding dangers of radioactive fallout, but, he points out, we do not know accurately what those dangers may be. What is needed he rightly suggests is the fullest information from the most reliable sources to enable some judgment to be formed of the possible dangers and risks. He feels that this information is located in the report on radioactive fall-out by Medical Research Council committee under Sir Harold Himsworth.

The scientist, reports Sir Hugh, has been increasingly sensitive to his lack of authority in the political application of his discoveries. Hence there is a demand among scientists that they should have an effective voice in the practical conduct of political affairs. According to Sir Hugh, they are in fact poised for the decisive move from the objective field of science to the subjective field of politics. Sir Hugh, however, is against this decision, which he calls tragic, if it were acted upon by any large group of scientists.

In today's world—'a world of propaganda, cold war and mass hypnotism by broadcasting—truth' he says 'is too easily a casualty.' This is not to say, however, that the scientist should stand aloof from the party political contest. His political duties, as Sir Hugh sees them, are to ensure that his discoveries are clearly presented to the public, where an eager audience awaits to be informed about the significance of scientific developments. Great responsibility, therefore, rests with particular weight on the shoulders of some individuals. Who are these individuals? They include the scientific correspondents of great newspapers, those who direct scientific programmes on radio and those who teach science in schools and universities. A special duty rests upon some of our scientific bodies both in specialised fields and generally. As Sir Hugh notes, the British Association for the Advancement of Science is at present considering ways by which at its annual meetings and otherwise it can disseminate still more widely a knowledge of the contributions science is making to human progress.

Emphasis is laid on the responsibility of scientists who assume the rôle of interpreters of science to the public, an undertaking regarded as of the highest

trust and 'worthy of the finest scientific brains we have.'

What minister, too, for that matter can provide the current answers of science to questions raised in the House? asks Sir Hugh. 'Not only must the answer be reliable, it must be shorn of the suspicion of party politics.' The political scientist with party politics to the fore must obviously handicap himself and render less effective his services both to politics and science.

With the idea in mind that the party political arena has no place for the scientist, Sir Hugh urges that the scientist should become the referee, not the player. The scientist, he says, 'has a great part to play of still almost unsuspected importance. He must be not only the discoverer of new things, but also the interpreter of them. He has not only the right, he has the duty to offer advice according to the highest standards of scientific objectivity.'

One wonders at this responsibility thrust on the scientist's shoulders to help out the politician by indicating to the public the meaning of new discoveries. Lord Halsbury in a note to Sir Hugh has suggested that the issue is whether scientists can do this effectively. He considers that scientists could offer explanations to the public more effectively if they could speak on political issues with more authority. This authority, he believes 'would come best from the exercise of a self-denying ordinance in political matters, namely by dissociating themselves from any political party.'

To the above Sir Hugh adds Sir Henry Dale's comments in a letter to *The Times* in 1945, in which he said that 'The true spirit of science working in freedom, seeking the truth only and fearing only falsehood and concealment, offers its lofty and austere contribution to man's moral equipment, which the world cannot afford to lose or diminish,' and finally Sir Hugh quotes Julien Benda's challenge in 'La Trahison des Cleves' wherein he asserted that if the intellectual was to perform his duty he had to keep himself clear of the compromises and temptations of politics.

In considering all that is mentioned in this lecture, it must be remembered that Sir Hugh himself is a trained pharmacist as well as a politician.

HYDROCARBONS IN OEEC AREA

HAS Western Europe enough deposits of crude oil and natural gas fields to make a decisive contribution to the constantly growing demand for hydrocarbons? The Organisation for European Economic Co-operation is giving a great deal of attention to this question. In 1956, OEEC Committee for Energy published a report entitled 'Europe's growing needs of energy, how can they be met'? Now the oil committee expresses an opinion on the future hydrocarbon situation of Europe in the just published 'The search and exploitation of crude oil and natural gas in the OEEC area.'

The aim of the present study is to make known to all who are interested in oil and natural gas prospection, the exact position at the end of 1956 in the member countries and in Spain and Yugoslavia with regard to discoveries of oil and gas classified geographically and geologically, estimated classification of the various regions in the OEEC area having regard to their oil prospects and statistics for past years and up to the end of 1956.

The information presented is by no means complete, as it has been obtained from 19 countries confronted with widely differing oil problems. However, it is valuable in that it gives a general picture of the European situation and indicates the developments which can justifiably be expected in the near future.

It appears that so far as exploratory drilling is concerned, the highest success percentage is that of Italy (25.2 per cent). This is of the same order as that found in the US in areas of intensive drilling. In the Netherlands the figure is likewise high, being close to the 1953 figure of the US.

Oil production in 1956 has been mainly from 'postwar' fields. The relevant percentages for Austria, France, Germany and Italy are 83, 97, 68 and 97.

As to production of natural gas in 1956, except in the case of Austria, the 'postwar' percentage is even higher than for oil. In Italy, the 'postwar' percentage of gas in the years 1955, 1954 and 1953 was 92 per cent, 91 per cent and 88 per cent respectively. The corresponding figures for Germany were 67 per cent, 31 per cent and 11 per cent. No figures are given for France, as the Lacq field, discovered in 1951, only began production last year.

Oil production is seen from this report to have shown a continuous and marked rise in almost all producing countries. The most impressive rise has been in Austria and Germany, and in 1954 and 1955 a sudden rise has been shown for France and Italy respectively.

With regard to natural gas, the continuous steep rise of Italian production is an outstanding achievement. Increasing quantities of gas have been produced also in the Netherlands, France and Austria, and considerable amounts were produced in Germany up to 1956.

The largest known gas reserves of Western Europe are in France. In 1956 the highest reserves were for Germany, followed by Austria, France, Italy, the Netherlands and Yugoslavia.

A graph has been prepared by OEEC showing annual production for the eight producing countries and estimated production for 1957, 1958 and 1959. This is evaluated at about 11.5, 13 and 14.5 million metric tons in 1957, 1958 and 1959 respectively. However, as it is believed that production in France and Italy might well rise more sharply than assumed in this graph, this OEEC report believes that most probably the above figures for the next three years represent the minima.

Playing a most important part in the increased development in hydrocarbon production, particularly of natural gas, has been the rapid increase in 'postwar' activities in the last 10 years especially in the petrochemical field. With the continuing and increasing expansion in this latter field, the value of oil and natural gas resources becomes highly important in the future.

Results of exploratory drillings in the UK have so far been discouraging. Moreover, the OEEC geological survey indicates that the areas most favourable to the accumulation of hydrocarbons are vast areas almost entirely unexplored and situated in the south-east and south-west of Europe.

It thus seems even more certain now that the UK will have to rely on imports of oil and natural gas to supply its needs. The OEEC report urges that every possible means should be found to encourage prospecting for new supplies and their rapid development. It recommends the adoption by all member countries of any administrative and legislative measures likely to give the greatest stimulus to prospecting and exploitation and, the establishment of wide co-operation between the member countries, at Government level and its specialised administrations, technical bodies and associations.

It is felt that the UK should take an active part in implementing such recommendations. Also we believe that every encouragement should be given and no effort should be spared by interested UK industrialists in carrying out exploratory surveys for oil and gas in the unexplored areas in Western Europe and coming to financial and other working arrangements with the various Governments or companies concerned.

FERTILISER SOCIETY'S ANNIVERSARY DINNER

Plea for Greater Study of Science of Fertiliser Usage

THE Francis New Memorial Lecture and Medal has been instituted by the Fertiliser Society in commemoration of the late Dr. Francis New, the society's secretary who died last year. It will be awarded at intervals of two years to men who have made valuable contributions to scientific and technical aspects of the production, use or application of fertilisers.

This was announced by Dr. B. Raistrick (Scottish Agricultural Industries Ltd.), president of the society, at the tenth anniversary dinner held in the May Fair Hotel, London, on 27 February. He was responding to the toast of the guests proposed by Sir Alexander Fleck (chairman, ICI Ltd.).

Among the company of 175 were a number of distinguished guests, including, Sir Lawrence Bragg, director of the Royal Institution; Dr. J. S. Carter, Chief Alkali Inspector; Dr. G. W. Cooke, chairman agriculture group, SCI; Sir Clavering Fison, chairman, Fisons Ltd.; Dr. W. H. Garrett, vice-chairman, Association of British Chemical Manufacturers; Sir Alexander Glen, secretary, Department of Agriculture for Scotland; M. R. Grandgeorge, president, International Superphosphate Manufacturers' Association; G. N. Hodson, chairman, British Chemical Plant Manufacturers' Association; Julian M. Leonard, past-president, SCI; Professor D. N. McArthur, director, Macaulay Institute; I. MacCormick, president, Fertiliser Manufacturers' Association; Sir William Ogg, director, Rothamsted Experimental Station; Professor R. Rae, director, NAAS; H. G. Rope, chairman, Superphosphate Manufacturers' Association; Professor H. G. Sanders, chief scientific adviser, Ministry of Agriculture; Sir William K. Slater, secretary, Agricultural Research Council; H. Stevenius-Nielsen, chairman, technical committee of the International Superphosphate Manufacturers' Association; Professor Stephen J. Watson, vice-chairman, Agricultural Research Council.

At the end of the speeches, Mr. Stevenius-Nielsen presented a silver salver to the society to mark its anniversary, on behalf of the members of the Danish Superphosphate Manufacturers' Association.

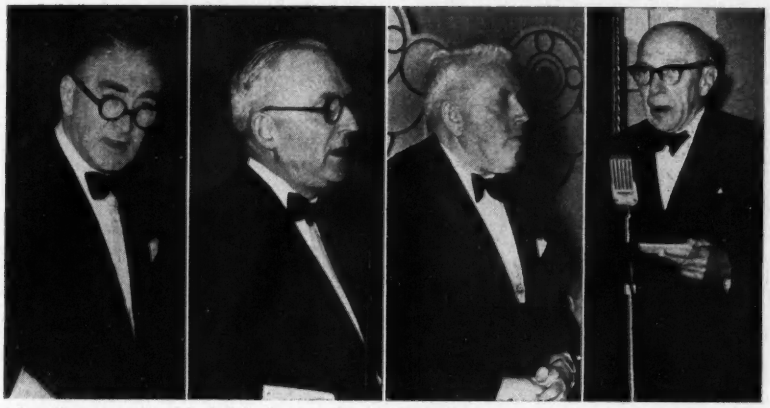
Proposing the toast of 'The Society', Sir Alexander Fleck made a strong plea for greater emphasis to be placed in the future on a scientific study of the use of fertilisers, rather than problems of manufacture. He referred to several aspects of the problem, including water, which he described as one of the biggest fertilisers. The conservation and proper use of water was of great importance.

Urea formaldehyde was used to a greater extent in the US than in the UK, but this development was, thought Sir Alexander, well worth following in this country. As far as phosphorus was concerned, a study of the reactions of anion exchange resins would hold great promise for the future. There was any amount of scope for obtaining increased knowledge of the use of potassium in the life cycle of plants and crops.

It would still appear, said Sir Alexander, that the most interesting feature of the use of potassium as a fertiliser was the precise rôle that it played in the metabolism of plants, for that was a gap in our knowledge that had yet to be filled. Since increasing amounts of potash were being used in agriculture, and rightly, its use to the plant was something about which we ought to know more.

Sir Alexander particularly urged the increased use of physical chemistry methods in the study of fertilisers and their applications. A greater study should be made of ionic balance in the soil and how it might be affected by the application of fertilisers.

The use of radioactive methods held out much hope. The ready availability of isotopes had given the soil chemist a great opportunity for the further study of such



After-dinner speakers included: l. to r. David Boyd, founder-president, Dr. E. Mayne-Reid, vice-president, Sir Alexander Fleck, chairman, ICI Ltd., and Sir William Ogg, director, Rothamsted Experimental Station

At the Fertiliser Society's 10th anniversary dinner: l. to r.: TOP, Dr. Bernard Raistrick receives the silver salver from Hans Stevenius-Nielson, A. Andrews and D. B. Idle, Eaglescliffe Chemical Co.; BELOW, from Fisons Ltd., F. Heppenstall, Dr. H. C. Millett and A. Gillies, D. J. Bird, vice-chairman Fisons, and Edmund P. Hudson, managing director, Scottish Agricultural Industries Ltd.

Sir William K. Slater, secretary Agricultural Research Council left, with Professor J. Watson, vice-chairman of the ARC

things as the mechanisms of phosphorus uptake. The Fertiliser Society, which had a great role to play in increasing knowledge of soil science, could make possible a far better understanding of the complex system of plant growth than was the case at present.

Dr. Raistrick said that the society, by no means antique, was flourishing before he joined the fertiliser industry seven years ago. He was proud to belong to a society that brought together its technologists, scientists, and agronomists for such fruitful co-operation. Membership, which was 250 in 1949 and 340 five years ago, was now 485 and was increasing steadily.

After announcing the Francis New Memorial Lecture and Medal, Dr. Raistrick said that he was sorry that their three hon. members, Sven Nordengren, Walter Packard and Dr. K. D. Jacob were not able to attend the dinner. He added that at their council meeting that morning, it had been decided to invite four more men to accept hon. membership. These were: Mr. David Boyd (Fisons Ltd.), Sir Alexander Fleck, Sir William Ogg and Mr. Hans Stevenius-Nielsen.

The toast of 'The Founders' was proposed by Sir William Ogg who said that of the founders of the first council, the following were present that evening: David Boyd, A. E. Sell, Douglas J. Bird, S. D. Curwain, C. H. J. Corbett, Edmund P. Hudson and A. T. Vernon. Mr. Boyd, a director of Fisons, had a long connection with the fertiliser industry, both on the technical and commercial sides. In recent years he had been particularly concerned with production and labour questions and had given valuable service in the labour relations of the chemical and allied industries.

Edward Sell, the first vice-president, had long been a leading personality in ICI's agricultural circles and until his recent retirement was a member of their board of central agricultural control. Douglas Bird, a vice-chairman of Fisons, had been a prominent figure in the industry, both nationally and internationally over the past 35 years. Edmund Hudson was now managing director of Scottish Agricultural Industries.

Responding, Mr. Boyd, spoke of the great advances that had been made in the past 10 years, particularly in the granulation of compounds. He added that much of that knowledge had been placed at the disposal of the society. The proceedings of the society were now distributed in 35 countries.

The toast of 'The Guests' was proposed by Dr. E. Mayne Reid, vice-president, and responded to by Mr. Hans Stevenius-Nielsen.

Twelve New Development Projects Reported by NRDC

CURRENT annual total value of royalty income derived from sale of goods made under licence from the National Research Development Corporation is now reckoned to be in millions of pounds. This is noted in the report and statement of accounts of the NRDC for the year 1 July 1956 to 30 June 1957, published 3 March 1958 by HMSO (price 2s net).

Twelve new development projects are reported. Of particular interest are the following:

Aldosterone: Production of a small quantity of this hormone is being undertaken at the Middlesex Hospital Medical School. A tissue incubation technique invented at the school is being used.

Gold from cyanide liquors: Ion-exchange resins which selectively remove gold from dilute cyanide solutions containing that metal in association with impurities have been developed by the radiochemical division, Chemical Research Laboratory, DSIR. Two British water-treatment companies are engaged in overcoming problems involved in transferring the process to a commercial scale. Field trials are in progress. Further research and development on this project is to be carried out by DSIR in association with UK Atomic Energy Authority.

Hydrogen-oxygen fuel cell: Development of this cell which has resulted from experimental work by Mr. F. T. Bacon of Cambridge is being sponsored by the corporation. In particular, techniques are now being developed for the construction of electrodes, cell assemblies and control systems. Construction of prototypes is being provided for and development of high pressure electrolysers is also being undertaken.

Expanded resin thermal insulating material: A pilot plant has been erected under arrangements with an industrial company and independent consultant and is now in operation to determine the technique and commercial prospects for an expanded light-weight plastics material with properties likely to make it suitable as a thermal insulator and for construction purposes.

Fletcher high vacuum metal extraction process: Laboratory scale work has been undertaken by a manufacturing company to evaluate Mr. R. Fletcher's technique whereby certain metals may be extracted from the vapour phase by decomposition of the metal halides at a high vacuum.

Pueraria extract project: Work is in progress at the National Institute for Research in Dairying and the Courtauld Institute of Biochemistry, Middlesex Hospital School, aimed at elucidating the structure of the oestrogenic substance, miroestrol, from the plant *pueraria mirifica* with a view to its ultimate synthesis.

News is given in the report of development projects referred to in previous reports. Thus it is noted that good headway has been achieved with the extraction of hecogenin from sisal juice using microbiological techniques at the University College of the West Indies.

In the improved process for producing acetylene by partial combustion of methane, development work at Imperial College of the combustion system has resulted in an improvement in performance over existing type burners. Arrangements are being made to continue the work at a small research station to be set up at the Sewage Purification Works at Isleworth.

A prototype of an air liquefier, particularly suitable for laboratory requirements, designed and built by the inventor at Reading University, has now been completed and is supplying the University's requirements for liquid air. Negotiations with an industrial concern for manufacture and sale of machines of this type are now at an advanced stage. A valuable by-product of this project has been the development of a stabilised high-speed air bearing for a 250,000 r.p.m. expansion turbine used in the air liquefier which may find wide industrial application.

Licensed inventions now making useful contributions to the financial future of the corporation include: an invention for resin-based paints containing pesticides which has been licensed overseas as well as in the UK; the process for the manufacture of an expanded resin product suitable for thermal insulation originally conceived for solidifying fuels such as petrol for ease of transport and now finding application in the manufacture of domestic fire-lighters; and triiodothyronine discovered by Dr. Rosalind Pitt-Rivers at London University and Dr. J. Gross (British), State University of New York Medical Centre. Substantial dollar royalties have been paid to NRDC by a UK licensee for manufacture and sale of the compound.

Report Says ICI May Reopen Ardil Plant

ICI LTD. are reported in the *Scotsman* to be considering the reopening of their Ardil factory at Drungans, Dumfries, for the manufacture of plastics but that production is not likely to start before 1960 or 1961 as new plant would have to be designed, constructed, and installed.

This is said to have been stated by the company in an announcement to their employees. The £2 million factory, which was built in 1950, was closed down by the fibres division at the end of last year because of the poor sales demand for Ardil. ICI head office decline to confirm or deny this report.

New AEA Address

After 10 March, the UK Atomic Energy Authority will move from St. Giles Court, London WC2, to its new address at 11 Charles 2nd Street, London SW1.

Trimethylol-propane, New ICI Product

TRIMETHYLOL-PROPANE has been added to the range of development products of the Nobel division of Imperial Chemical Industries Ltd., and a pilot plant is now being operated. Trimethylol-propane, or 1,1,1, tris (hydroxymethyl) propane is a solid trihydric alcohol with three primary alcoholic hydroxyl groups. By comparison with most other triols, trimethylol-propane offers three advantages: it has higher resistance to thermal degradation; the three hydroxyl groups react at a more uniform rate in alcoholysis, esterification and other reactions, thus giving better control and more complete reaction; alone and in its compounds, it is more compatible with organic reagents and solvents.

Expected outlets for trimethylol-propane are in surface coatings, and in the formulation of polyurethane foams and resins. Short-oil length alkyds of improved properties, particularly in respect of alkali resistance, can be formulated with trimethylol-propane In the polyurethane field, trimethylol-propane is used as a cross-linking agent in the formulation of flexible and rigid foams; it has excellent compatibility with organic media, and this helps in obtaining polyurethane foams of superior quality. Trimethylol-propane is also expected to find outlets in the polyester resin field, and for ester type plasticisers.

Organic Chemicals Liable to KID

THE supplementary list of synthetic organic chemicals liable to Key Industry Duty, referred to in CHEMICAL AGE, 1 March, p. 407, is as follows:

4-Acetamido-3-nitroanisole; 2-acetamido-4-nitrobenzoic acid; acet-*N*-*n*-butylanilide; 1-allyl-6-amino-3-ethyluracil; 1-allyl-6-aminouracil; 4-aminobenzonitrile; 8-amino-6-methoxyquinoline; 2-*p*-aminophenylethylamine; ammonium isothionate; benzotriazole; calcium DL-pantothenate; calcium formaldehydesulphoxylate; *mono* (carboxymethylthio) succinic acid; *N*-2-chloroethyldiethylammonium chloride; *N*-2-chloroethyldimethylammonium chloride; *N*-2-chloroethyldiisopropylammonium chloride; 1-(2-chloroethyl)piperidinium chloride; 5-chloro-2-hydroxybenzophenone; α-(4-chloro-2-methylphenoxy) propionic acid; *N*-3-chloropropyldimethylammonium chloride; choline carbonate; choline hydrogen carbonate; copper 8-quinolinoxide; creatinine 5-hydroxytryptamine sulphate; 4-cyanobenzaldehyde; 2-cyclohexylcyclohexanone.

2:7-Diamino-10-ethyl-9-phenylphenanthridinium chloride; di-(2-carboxymethylthioethyl) ether; diethanolammonium α-(4-chloro-2-methylphenoxy) propionate; 2:2'-dihydroxy-1.1'-dinaphthylmethane-3:3'-dicarboxylic acid; dipiperidinomethane; *n*-dodecyl thioglycollate; 3-ethyl-3-methylglutarimide; 1-ethyl-1:2:3:6-tetrahydropyridine; *n*-hexadecyl thioglycollate; 4-hydroxybenzonitrile; 2-(2-hydroxyethylamino) phenol sulphate; 2-hydroxy-4-methoxybenzophenone; 2-hydroxy-4-methoxy-4'-methylbenzophenone; *p*-hydroxypropiophenone; mephentermine; mephentermine sulphate; 1-methyl-2-mercaptoiminazole; 4-methylpiperidine; 1-methyl-1:2:3:6-tetrahydropyridine; 5-nitrofurfuraldehyde semioxamazone; 1-(5-nitrofurfurylideneamino) hydantoin; 3-(5-nitrofurfurylideneamino)-2-oxazolidone; 5-nitrofurfurylidene diacetate; *p*-nonylphenol.

Piperazine glutamate; piperazine theophyllin-7-ylacetate; potassium α-(4-chloro-2-methylphenoxy) propionate; potassium γ-2:4:5-trichlorophenoxybutyrate; propionaldoxime; sodium 3-(2-acetyl-1-phenylethyl)-4-hydroxycoumarin; sodium aurothiosuccinate; sodium α-(4-chloro-2-methylphenoxy) propionate; suxamethonium bromide; suxethonium bromide; tetrahydrothiophen; theophylline *mono*ethanolamine; thiobenzoic acid; 1:4-thioxan; *p*-toludiethylamide; γ-2:4:5-trichlorophenoxybutyric acid.

The Order, which came into operation on 1 March, is SI, 1958, No. 292 and may be obtained (price 3d net, by post 5d) from HM Stationery Office, Kingsway, London WC1, and branches, or through any bookseller.

PLANT PROTECTION OPEN NEW LABORATORIES AT YALDING

AN ENTIRELY new laboratory block with an area of approximately 11,000 sq. ft. was completed in February for Plant Protection Ltd. (a subsidiary of Imperial Chemical Industries Ltd.) at Yalding, Kent. Forming part of the chemical group of Plant Protection's technical department, the work of the new laboratories is divided into three sections; analytical, formulation and intelligence.

The first Yalding laboratories were built 25 years ago. They were later expanded but within five years proved wholly inadequate, says Mr. J. F. H. Cronshey, head of the technical department, Plant Protection. The new laboratories have been planned and built to supplement them.

Most important work of the analytical section is quality control, both of final product and of materials used in their manufacture. Procedures regularly employed include chromatography, spectrophotometry, determination of organophosphorus compounds such as Tetram by their effect on an enzyme in the blood, and methods for the determination of mercury in the atmosphere at the manufacturer's and at seed dressing plants.

Volatility of crop protection chemicals is measured in the formulation section. The product is placed in a constant temperature bath; air at the same temperature is drawn over the product and the resultant vapour is absorbed in a suitable medium.

WHO Standard

Internationally accepted standards relating to physical properties of powders are laid down by the World Health Organisation. These relate to physical properties such as dispersibility, storage properties, etc. The assessment of a typical DDT formulation against WHO specifications is typical of the formulation laboratory's work.

Studies are also being made of emulsifiers, emulsions and miscible liquids. An example of this work is the improvements claimed for BHC liquid formulations in the last 10 years.

Assessment of the suitability of packages is an important part of the formulation laboratory's work. Detailed examination of experimental packages which have contained chemicals for varying periods of storage is carried out.

The new laboratory occupies approximately twice the area of the old laboratory. Staff, however, remains the same at 45.

Products manufactured at Yalding, which is Plant Protection's only factory, include the Agrosan, Mergamma and Fernasan range of seed dressings, together with gamma-BHC products and DDT products. However, the Yalding laboratory carries out testing on plant protection products made at all branches of ICI.

'The technical department of Plant Protection Ltd. is in some ways unique in the crop protection industry', writes Mr. Cronshey. 'In most laboratories connected with this work you will find research on new chemicals, work to create products from them, and biological work to test them, all housed together. ICI have, however, a separate group at the Jealott's Hill laboratories at Bracknell, Berkshire, where research on potential new insecticides, weedkillers and fungicides goes on in association with research and development work on fertilisers. Plant Protection have separate laboratories at Fernhurst Research Station near Haslemere, Surrey, for the biological testing of products made at Yalding'.

Determining the volatility of a crop protection chemical in the Plant Protection laboratory at Yalding, Kent. The product under test is held in a constant temperature bath in the foreground. Air at the same temperature is drawn over it and the vapour is absorbed in a medium in the vessels in front of the chemist.

Synthetic Rubber Output Up in 1957

FROM statistics so far available, it appears that consumption of rubber including synthetic rubber during 1957 totalled around 3,150,000 tons of which 1,900,000 tons was natural rubber while production of all rubbers totalled roughly 3,190,000 tons of which 1,930,000 tons were natural rubber. This was reported at the annual general meeting of the Rubber Trade Association of London, by Mr. Maurice Symington, the chairman.

Thus some 30,000 tons more natural rubber was produced than consumed which compares with an estimated deficiency of 36,000 tons arrived at by the International Rubber Study Group at Jogjakarta in June last year.

Approximately 110,000 tons more of all rubbers was used in 1957 compared with 1956, all of which increase was met by synthetic rubber.

★ POSSIBILITIES of sulphur recovery always come to mind when hydrogen sulphide is produced during processing. Last week, p. 389, we published details of Humphreys and Glasgow's new £2 million gas plant at Partington. It was learned that it is proposed to remove the greater part of the hydrogen sulphide and carbon dioxide by absorption in a solution of potassium bicarbonate utilising the Benfield process.

The Partington plant is looked upon as a full-scale demonstration unit and hence its cubic capacity is comparatively small (7.5 million cubic feet of gas a day). Also the feedstocks to be used are expected to have a low sulphur content. Any small amounts of carbon dioxide and sulphide not taken up by the Benfield plant, will, it is learned, be burned after catalytic conversion of the H_2S to SO_2 and discharged to the air.

However, when larger plant is installed to handle between 20 and 30 million cubic feet of gas a day, sulphur recovery may be a more economic proposition. Ways for sulphur recovery have been considered and the choice has fallen on the burning of H_2S in a modified Klaus kiln (modified because of the CO_2 present).

★ THE days when it seemed that fertiliser manufacturers would outnumber their farmer customers were referred to by Sir William Ogg, director of the Rothamsted Experimental Station, when he proposed the toast of 'The Founders' at the tenth anniversary dinner of the Fertiliser Society last week (for report see p. 443). He recalled that the first fertiliser factory was set up by J. B. Lawes at Deptford Creek in 1842 and the second a year later at Snape in Suffolk by Edward Packard, the grandfather of Walter Packard an hon. member of the society.

This new industry must have proved lucrative; it was certainly prolific for census figures listed 581 manure manufacturers in 1861 and 1,210 by 1871. Sir William added: 'Fortunately they practised cannibalism for at that rate they might soon have outnumbered farmers'.

Another speaker, Sir Alexander Fleck, who with Sir William, has been made an hon. member of the society, urged members to concentrate more on a scientific study of the applications of fertilisers and of soil science, than on production matters. He declared that it was only by continuing to delve into all the fundamental aspects of soil chemistry and that of plant nutrition that they would find the key to the most effective use of fertilisers.

He spoke of the valuable contribution to be made by radioisotopes. I wonder how many of my readers realise that their application is of particular interest to Sir Alexander. In his early days in the laboratory he worked at Glasgow on radioactive elements.

★ ALTHOUGH the use of chemical assistants by the bleacher and dyer goes back to the 18th century, the main developments in this field did not take place until the 20th century. These developments were the theme of a lecture given recently by Mr. F. W. Thomas of the British Cotton Industry Research Association to the SCI fine chemicals group.

It is not always generally realised that as early as the first world war surface active phenomena were being studied, resulting in the large variety of detergent, emulsifying, dispersing, softening and wetting compounds now available.

Great advances have also been made in chemical protection against moulds and bacteria and in the protection of wool against moths. Mothproofing agents used included colourless dyestuffs of the triphenylmethane series.

Durable flame-resistant finishes had received close study, said Mr. Thomas. In this respect it was of interest to note in last week's CHEMICAL AGE (p. 392) that the UK is ahead of the US in flameproofing and in other aspects of finishing.

Mr. Thomas claims with some justification that the textile industry has long been one of the fine chemical industry's best customers.

★ THE CHILEAN fertiliser industry has been having a thin time. A major reorganisation scheme is planned for the nitrate sector and now producers of phosphate fertilisers are also going through an uneconomic phase. Main reason is the free import of phosphate fertilisers.

The Minister of Agriculture states that free imports have been permitted because of the importance of phosphate fertilisers in improving agricultural production, the high price and shortage of fertilisers produced in Chile and the fact that the imported product has almost double the fertilising power of domestically produced phosphates.

The Minister's parting shot is that so long as the Chilean industry is unable to improve in efficiency, it will be necessary to import the raw materials and manufacture phosphate fertilisers for direct use by the country's farmers.

★ EUROPE is ICI's biggest single export market, taking last year more than a quarter of the company's total exports of £70 million. This trade is, of course, largely with West Europe. The company's desire for greater trade with the East European block has been clearly indicated by recent trade missions undertaken by ICI. Now the company are taking part in the Leipzig International Spring Fair.

Their stand describes some of the remarkable scientific discoveries made in ICI laboratories, and shows how production has so developed in the company's 100 British factories that it can now offer more than 12,000 different products. The stand will also trace ICI's growth internationally.

Products being stressed at Leipzig are the range of Procion reactive dyes; polythene, Perspex; the antiepileptic drug Mylepsin (Mysoline), the antimalarial Paludrine, Sulphamezathine and Fluothane, the new anaesthetic; *iso*-octanol, octylphenol, nonylphenol; and the company's range of catalysts.

★ IN connection with trade with East Europe, I was interested to learn of the success that Industries Group Sales Ltd., of 7 Rugby Street, London WC1, have had in establishing cordial relations with trading organisations in the area as well as in China. This company, set up last September to act as an extended selling organisation on behalf of a cross-section of UK industry, represents a number of chemical firms.

These are Abril Industrial Waxes Ltd., Bridgend, Glam; Boulton and Haywood Ltd., London WC2; British Schering Ltd., London W8; Midland Tar Distillers Ltd., Oldbury, and Allen and Hanburys Ltd., London E2. Other firms represented include those making electronic and scientific instruments, pumps etc.

Industries Group Sales have made a special drive on the Polish market. As well as exhibiting at the Poznan Fair in June, they have sought permission to open a Warsaw office. Subject to certain conditions, the Polish Government has agreed; the office would have to carry adequate spares and to offer technical advice as well as acting as a sales headquarters.

★ TO ENSURE that tablets made from Monsanto aspirin match up to customer requirements, Monsanto Chemicals Ltd. now make their own aspirin tablets. But they cannot be bought in the shop for they never reach the public; they are made at the Nickell Laboratories, which they leave only to be disposed of as waste.

This fully-equipped tabletting and tablet testing section enables Monsanto to produce a tablet to close specifications and helps customers to make full use of a high-grade aspirin. In the charge of Mr. S. Griffiths, the laboratory has a Manesty tabletting machine, a hardness tester and a disintegrating machine.

To match any given tablet, a tablet is analysed to find the exact proportion of the ingredients, such as aspirin, phenacetin, starch, etc. Then an experimental batch is mixed and tabletted.

Alembic

FIRST LURGI LOW PRESSURE GASIFICATION PLANT

Gas from Low Grade Coal

BRITAIN'S first Lurgi low pressure gasification plant is to be built for the Scottish Gas Board at Westfield, near Loch Leven, Fife, by Humphreys and Glasgow Ltd., Humglas House, Carlisle Place, London SW1. To cost £6,500,000 the process will enable gas to be made from low grade coal containing up to 25 per cent ash and 16 per cent moisture which is unsuitable for normal carbonising plant.

Capacity when complete will be 30 million cu. ft. of gas a day. An interim stage, valued at £4 million, will be built for an output of 15 million cu. ft. a day. The final figure represents one-fifth of Scotland's gas requirements.

It is estimated that a conventional gas-making plant would cost about £1 million more.

Tests on the Westfield coal have been carried out in a pilot plant in Germany.

In addition to the gas-making plant the Humphreys and Glasgow contract includes all civil engineering work and buildings, electricity generating plant, and every operation in erecting the works on a site which is now open fields. Work will begin in June.

The coal will be completely gasified in the Lurgi generators at a pressure of about 25 atmospheres in a continuous stream of oxygen and superheated steam.

Humphreys and Glasgow, in association with the Power Gas Corporation, have reached an agreement with the Lurgi Company of Germany to build this section of the plant. At present it is planned that the plant will be fabricated in the UK.

Heat in the crude gas from the generators will be used to produce steam in waste heat boilers. Tar, oils and ammonia in the effluent will be recovered, the ammonia being concentrated in a plant to produce a 20 per cent solution for sale. Benzole, a valuable by-product, will also be recovered from the crude gas using a process developed by Benson and Fields of the US Bureau of Mines.

The proportion of hydrogen in the gas is increased by a catalytic conversion plant. Carbon dioxide is next washed out in a Benfield plant.

The gas is then enriched by the hydrogenation of oil in a process developed by Dr. F. J. Dent, director of the Gas Council's West Midlands research station, where Humphreys and Glasgow have already built a 1 million cu. ft. per day hydrogenation pilot plant.

Finally it will pass through a further benzole recovery plant, recovering high purity benzene, before passing through pressure oxide purifiers, in which the final traces of hydrogen sulphide not removed in the Benfield plant will be taken out to meet the gas referees' requirements.

The Lurgi generators will give a crude gas having a calorific value of about 300 BThU per cu. ft. Ultimately the output of purified Lurgi gas will be about 22 million cu. ft. per day. When enriched in the subsequent processes, this will give a total works output of 30 million cu. ft. per day of town's gas.

Oxygen required for the gasification process will be obtained from two air separation plants, which also produce nitrogen. The nitrogen will be used for adjusting the combustion characteristics of the gas at the end of the process stream.

To increase the percentage of hydrogen in the Lurgi gas for the subsequent enrichment process, a shift reaction will be used to produce hydrogen and carbon dioxide from the carbon monoxide which is present in the gas. This reaction is carried out at high pressure and temperature in the presence of iron oxide catalyst.

Following the catalytic conversion of the carbon monoxide, the carbon dioxide produced—together with the carbon dioxide originally present in the crude gas and the bulk of the hydrogen sulphide—will be washed out in the Benfield plant. Humphreys and Glasgow are licensees for this process, the principle of which is the absorption of carbon dioxide and hydrogen sulphide in hot potassium carbonate solution. The steam required in the process will be supplied from the waste heat boilers.

When it leaves the Benfield plant, the gas will have a calorific value of about 400 BThU per cu. ft. Enrichment by the hydrogenation process will raise this to about 700 BThU per cu. ft., with a specific gravity of about 0.44. (Specific gravity of air = 1.)

Before distribution, the gas will be diluted with nitrogen to the normal calorific value of town's gas, 450 BThU per cu. ft. and a specific gravity of 0.5.

In the interim stage, when the plant will have a capacity of 15 million cu. ft. per day, the crude Lurgi gas will pass straight to a Benfield washing plant, and the gas with a calorific value of 400 BThU per cu. ft. will be enriched with butane before distribution. Butane will be obtained from the plant of Scottish Oils at Grangemouth.

Mr. Sydney Smith, chairman of the Scottish Gas Board, said that supplies of good quality coking coal, both in Scotland and the UK as a whole, were diminishing rapidly.

At present both coal and oil were imported. The Lurgi plant will assist in the reduction of imports and should help to keep the price of gas as low as possible.

Asked about the connection between Humphreys and Glasgow and Power-Gas, Mr. G. G. Farthing, Humphreys and Glasgow chairman, said that the two companies were normally competitive. However, Humphreys and Glasgow possessed no works of their own and it was only natural that they should co-operate in this project.

93-Ton Tower Erected at ICI's Heysham Works

A LARGE 135-ft.-tall and 93-ton stainless-steel absorption tower which forms part of the large-scale extensions being made to ICI's Heysham fertiliser plant, was lifted into position recently in only one-and-a-half hours. Fabricated at the Stockton works of Ashmore, Benson, Pease and Co., the 15-ft. diameter tower is one of two being erected as part of the new nitric acid plant which forms part of the extensions.

Taken to Heysham by road in two 65-ft. long sections, the tower was welded on the spot, all welds being X-rayed by a mobile unit on the site. The 100-ton guy derrick which lifted the tower into position had previously been used to lift reactors and stacks into position at the Calder Hall atomic power station.

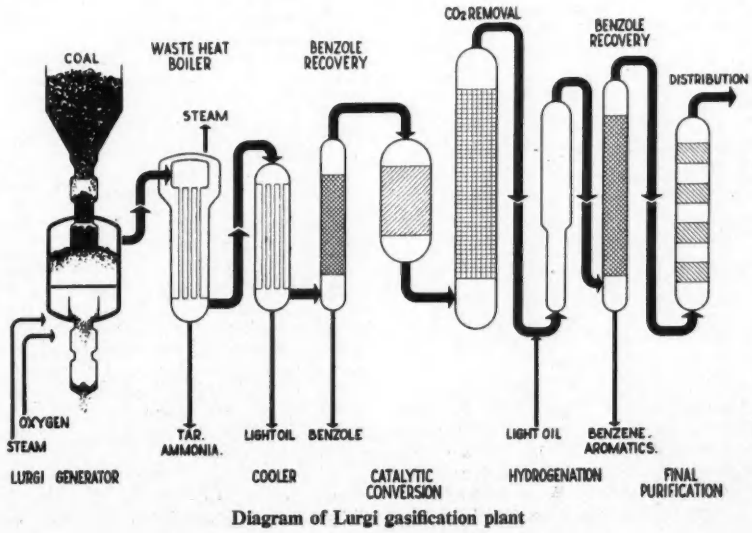


Diagram of Lurgi gasification plant

PROGRESS IN SYNTHESIS OF HYDROCARBON POLYMERS

Professor Bawn at Bradford Symposium

THE REMARKABLE progress in the synthesis of hydrocarbon polymers which has been made during the last few years is not only of great technological importance but is of equal significance to the fundamental and theoretical aspects of polymerisation kinetics and polymer structures, commented Professor C. E. H. Bawn, Grant-Brunner Professor of Chemistry at Liverpool University, when he addressed the symposium held recently at Bradford Institute of Technology, on the subject of 'The chemistry of plastics and polymers'. (See CHEMICAL AGE last week, page 391.)

Professor Bawn said that the developments arose mainly from the discoveries of new kinds of catalysts which enable (a) certain vinyl monomers to be polymerised to molecules containing large sequences of monomeric units having definite steric configuration and (b) some monomers, particularly the 'α-olefins' (alk-1-enes and their derivatives) which could previously only be polymerised with great difficulty even to products of low molecular weight, to be polymerised under ordinary conditions of temperature to crystalline products of high molecular weight.

It had long been recognised that vinyl-type addition polymerisation was a chain reaction in which the chains might be initiated by free radicals, positive carbonium ions, or negative carbanions.

Polymerisation of many vinyl monomers might also be initiated by catalysts of the Friedel-Crafts type ($SnCl_4$, $AlCl_3$, $TiCl_4$,) in which the initiating reaction was the formation of a carbonium ion. This usually occured by transfer of a proton or other cation to the monomer, for example:

$$BF_3 + H_2O \rightarrow H + BF_3 \cdot OH-$$

$$BF_3OH_2 + CH_2 = CHX \rightarrow$$

$$CH_3-\underset{\displaystyle X}{\overset{\displaystyle H}{\underset{|}{\overset{|}{C}}}}\ (BF_3\cdot OH)-$$

and propagation consisted of successive additions of the monomer to the carbonium ion:

$$-CH_2-\underset{\displaystyle X}{\overset{\displaystyle H}{\underset{|}{\overset{|}{C}}}}+ + CH_2 = CHX \rightarrow$$

$$-CH_2-\underset{\displaystyle X}{\overset{\displaystyle H}{\underset{|}{\overset{|}{C}}}}- + CH_2-\underset{\displaystyle H}{\overset{\displaystyle H}{\underset{|}{\overset{|}{C}}}}+$$

Monomers with electronegative substituents polymerised by an analogous anionic mechanism in the presence of reagents forming carbanions, e.g. sodium or potassium amide in liquid ammonia.

Within the last few years new kinds of catalysts had been discovered which not only initiated chain growth but also exerted a directing influence on the propagation reaction. It was believed that many of these catalysts act heterogeneously—the process being initiated and occurring at sites on the surface by a growth reaction which was anionic in character. In this way polymers having a well defined stereochemical structure had been synthesised for the first time.

The difference in properties of the various hydrocarbon polymers is considerable', remarked Professor Bawn. The atactic polymers were amorphous and non-crystallisable, and had low softening temperatures. Completely isotactic or syndyotactic polymers generally showed much higher melting points, higher crystallinity and better mechanical properties. It was interesting that the melting point decreased with increase in the chain length of unbranched olefins (polypropene to polypentene), but increased greatly if the molecule was substituted by alkyl groups in position 3, 4 or 5.

Normally the polymerisation of 1:3 dienes such as butadience (1) or isoprene (11) led to the formation of polymers of

$$CH_2=CH-CH=CH_2$$

(1)

$$\overset{1}{H_2C}=\overset{2}{\underset{\displaystyle CH_3}{\overset{|}{C}}}-\overset{3}{CH}=\overset{4}{CH_2}$$

(11)

various structures and configuration according as addition occured in the 1:4- or the 1:2 position.

TABLE

Polymer	Melting point Atactic degrees	Melting point Isotactic degrees
Ethylene	135	135
Propene	–35	160–170
But-1-ene	–42	120–130
3-Methylbut-1-ene		250–300
Pent-1-ene		70–80
4-Methylpent-1-ene		205–235
4:4-Dimethylpent-1-ene		320
Hex-1-ene		–55
4-Methylhex-1-ene		188
5-Methylhex-1-ene		> 130
Hept-1-ene		–40
Styrene	85	230

1:4—Structure $-CH_2-CH=CH-CH_2-$

1:2—Structure $-CH_2-\underset{\displaystyle CH=CH_2}{\overset{|}{CH}}-$

Usually both types of addition occured together in a random manner forming a structure which is very complicated.

Recently highly significant examples of directed polymerisations had been observed with dienes. Starting with isoprene several methods had been announced for its polymerisation to a cis-1:4 polyisoprene almost indistinguishable from natural tree-grown rubber. For the first time it appeared that the method of the synthesis of rubber in nature had been closely approached. One of these processes used a dispersion of 0.1 part of lithium metal as catalyst in 100 parts of isoprene, and other processes used catalysts of the Ziegler type.

The most significant development in the field of catalysts and mechanism of stereospecific synthesis was the discovery by Ziegler in 1953 using a catalyst formed by the interaction of aluminium triethyl, or other metallic alkyls, and certain metallic halides, such as titanium tetrachloride, suspended in a hydrocarbon, that ethylene polymerised readily at ordinary pressures and temperatures to give a relatively unbranched polyethylene of high molecular weight. In a sense, the low pressure polyethylene can be regarded as an example of a polymer with a completely orientated structure.

Other kinds of catalyst were being successfully employed for low pressure polymerisation of olefins. As with the Ziegler systems, this work was shrouded in patent secrecy although some of the catalyst systems had been identified.

The catalyst used by the Phillips Petroleum Co. for example, consisted of an activated chromium oxide on a silica support. This company also claimed to have synthesised cis-, trans, and 1:2 polybutadiene. The use of similar types of catalysts had been reported by the Standard Oil Co. of Indiana.

At the present time it appears that typical Ziegler-type catalysts have not been successfully used in the synthesis of crystalline polymers from polar monomers such as vinyl chloride or acrylonitrile. It was, however, with the polar monomer isobutyl vinyl ether that a crystalline high polymer of regular stereochemical structure was produced by Schildnecht *et al.* They observed that the isobutyl polyvinyl ether formed at low temperature in presence of a typical Friedel-Crafts catalyst (boron trifluoride-ether complex) was a crystalline material when polymerisation occurred heterogeneously, but a rubbery solid when it occurred homogeneously.

Concluding, Professor Bawn mentioned another highly significant example of stereospecific synthesis which, although not a vinyl polymerisation, showed similarities of mechanism. Price *et al.* observed that with a ferric chloride catalyst both (+)- and (−)- 1:2 epoxypropane gave polymers which could be separated into an amorphous fraction of intermediate molecular weight and a crystalline fraction of high molecular. There was no difference between the products from the optically active and the racemic monomer and Price *et al.* concluded that the catalyst was highly selective in orientating the configuration of asymmetric centres along the polymer chain and that the formation of crystalline polymer occurred at heterogeneous catalyst sites, the catalyst which produced amorphous polymer being in solution.

It was apparent that these developments, although still in their very early stages of study, had opened a new chapter in polymerisation, and the stereochemistry of the polymer molecule. It was to be expected that homogeneous catalysts for stereospecific synthesis would be discovered and that the results would be extended generally to polar monomers.

ADVANCES IN POLYMER TECHNOLOGY

Summaries of Papers Presented at Joint London Symposium

SUMMARIES are given below of papers read at the joint conference on 'Recent Advances in Polymer Technology' which was held by the Institution of the Rubber Industry and the Plastics Institute at the Institution of Civil Engineers, Great George Street, London SW1, on 27 February.

The first speaker was Sir Harry Melville, of the Department of Scientific and Industrial Research, who discussed 'Recent advances in polymerisation techniques'.* The other lecturers were: Mr. H. A. Braendle, Columbian Carbon Co., US ('Masterbatching techniques')†; Mr. R. H. Dykehouse, Cooke and Dykehouse Plastic Machinery Co. Ltd. ('The practical and economic importance of replasticising equipment to the moulder and its ultimate effect on industry')*; Dr. C. P. Pinazzi, Institute Français du Caoutchouc ('Hydroxymethyl resorcinol polycondensates in rubber')†; Dr. W. F. Watson, British Rubber Producers Research Association ('Chemical reactions induced by polymer deformation')†; Professor G. Gee, University of Manchester ('The rubber-like state')†; Professor A. Charlesby, Royal Military College of Science ('Radiation and Polymers')†; Mr. Bain and Mr. W. H. T. Davison, Tube Investment Research Laboratories ('Radiation processing')*; Dr. J. T. Watts, dyestuffs division, Imperial Chemical Industries Ltd. ('Urethane foam process')*; Mr. F. Chapman, Whiffen and Sons Ltd. ('Expanded p.v.c.')†; Mr. A. Cooper, Expanded Rubber Co. Ltd. ('Properties of cellular polymers')*. Chairmen of the morning sessions were Dr. J. C. Swallow, Mr. G. Martin, Mr. C. W. Welch and Dr. L. Bateman. In the afternoon sessions, the chairmen were Mr. A. S. Bishop, Mr. M. Apley and Mr. M. Jones.

Papers marked thus * are to be published in the Plastics Institute's *Transactions*. Those marked thus † are due to be published in the Institution of the Rubber Industry's *Transactions*. It is hoped to publish the discussions with the papers in these publications not later than October, 1958.

Advances in Polymerisation Techniques

Although essentially no new methods had been developed, nor had any new principles been established, polymerisation techniques had taken a new lease of life within the past five years. Simultaneously, developments had taken place in a number of directions. Also, poly condensation methods have progressed steadily with the accumulation of an increasingly large number of practical systems. This was stated by Sir Harry Melville in 'Recent advances in polymerisation techniques.'

In addition to polymerisation, the growth of new ideas had been striking. The most important advances had come from the invention of methods of controlling the internal molecular geometry of many polymers, particularly hydrocarbons. This had been achieved by the discovery of new kinds of catalysts, mainly acting as true heterogeneous catalysts. By these new methods control of molecular weight distribution seemed to be now a practical possibility.

Methods had also been developed for the production of graft copolymers of a great variety of types. Similarly, considerable progress had been made in the methods of synthesising linear block copolymers. The further investigation of the so-called living polymers had suggested quite novel ways of synthesising block copolymers and in modifying the terminal structures of polymer molecules.

Besides these developments the use of high energy radiation in inducing polymerisation and in modifying the structure of polymers had passed the fundamental stage and was on the verge of commercial exploitation.

Masterbatching

Adaptations in 'Masterbatching techniques' were dealt with by Mr. H. A. Braendle. 'Masterbatch', a rubber industry term, denoted a concentrated predispersion of some compounding ingredient in rubber intended as a 'stock' item for later use in a complete formulation. The plastics industry was adopting the same terminology just as it had adopted and adapted much rubber processing equipment and techniques. Such premixes (masterbatches) had long been commercially available in many media under the name of predispersions or base dispersions.

A variety of masterbatching techniques adapted to the nature of the plastics, resin, or elastomer, and to the end use, had been developed, said the lecturer. With pigments generally, and carbon black particularly, the commonest procedure had been to mill at high or even extreme viscosity. This brought high shearing forces into play to effect dispersion. Significant variations of this basic method were made to attain specific objectives.

The general approach for carbon black—rubber masterbatches had been high viscosity milling. The approach through latex was the oldest technique and the one most persistently pursued. Prior to the development of the synthetic rubber industry in the US during World War II, latex masterbatching was economically unattractive. When rubber latex and carbon black became available in the same country, interest in latex masterbatching revived to be further stimulated by the increase in capacity of installed rubber processing equipment this technique made possible. In 1952 production of latex-black masterbatch reached a peak of 132 thousand long tons. Competition, traditional in the rubber industry, called for a better process and a better black-rubber masterbatch. The system described in this lecture represented a step in this direction. It was continuous and simple in theory and operation. More important, it produced significant improvements in tyre tread wear and shortened processing time in the tyre factory. In essence, it brought the two components, rubber and carbon black, together as colloids with minimum physical and chemical interference with their ultimate union.

Expanded p.v.c.

The subject of Mr. F. Chapman's lecture was 'Expanded p.v.c.' He remarked that expanded p.v.c. products (both unicellular and open-cell) were now coming forward in increasing quantities. In general, either chemical blowing agents or carbon dioxide gas were used to produce the expansion required. In the former case, production was frequently batch-wise and for a completely unicellular product operation under pressure was necessary. In the latter case, continuous production processes were now available. Both types of process were described by Mr. Chapman.

By varying the p.v.c. plasticiser ratio, the hardness of the expanded product could be varied over a very wide range said Mr. Chapman. This lead to commercial outfits of equal diversity varying from upholstery to marine and buoyancy materials. It was pointed out, however, that expanded p.v.c. provided an excellent non-flam core material for many types of structural laminate, the full exploitation of which had yet to be realised.

Cellular Polymers

The generally accepted classification of cellular polymers was considered by Mr. A. Cooper in 'Properties of cellular polymers'. He showed how their cell structures affect their physical properties, illustrating his points by photomicrographs.

The general properties of cellular polymers were discussed in considerable detail, and also matters such as number of cells per unit volume, high and low temperature behaviour, compression set, and shrinkage, mechanical properties as related to the density of the product, were surveyed.

Reference was made to electrical properties, acoustical properties, resistance to mould and fungus growth, and attack by pests.

Effects of Certain Resorcinol Formaldehyde Resins on Latex

SPEAKING on 'Hydroxymethyl resorcinol - formaldehyde resins' Dr. C. P. Pinazzi remarked that the effects of certain resorcinol-formaldehyde resins on latex had been already described by J. Le Bras. The mechanical properties obtained were clearly remarkable. According to the author and R. Cheritat, it was no longer possible to believe that there was present a phenomenon analogous to the reinforcement of dry rubber with carbon black; the structure of the rubbers obtained by the 'gelling' of latex-resin mixtures without mechanical means was clearly quite specific.

It was therefore desirable to produce resins of the resorcinol type capable of being introduced, not in latex, but in the dry rubber in order to ascertain whether or not the known morphological structure of latex gels was responsible for the property anomalies observed.

Study of the resorcinol-formaldehyde condensation had resulted in the isolation of two substances (I) mono-hydroxymethyl resorcinol and (II) dihydroxyresorcinol. The preparation, chemical constitution and the properties of both compounds as well as their condensation, had also been studied. Both (I) and (II) were strongly crystalline, relatively stable in an atmosphere of CO_2 and in the absence of moisture. Condensation began in both cases as soon as the temperature rose, and the reaction could be carried out in both aqueous and organic solvent solution. Tri-dimensional insoluble and unfusible resins were formed.

The methods of introduction of (I) and (II) into rubber during the mixing process, and the resulting polycondensation under the action of heat, again during the mixing process, were described. The vulcanisates obtained possessed mechanical properties substantially different from those of pure gum rubber, especially so far as 'modulus' was concerned; the values were distinctly higher. Nevertheless, it was the polarity of the reacting resin-forming compounds and the formation, *in situ*, of water of condensation, that drew most attention. The difficulties raised by the existence of the first were in part removed by the use of an elastomer possessing some polarity itself, e.g. Perbunan, or better, a rubber suitably modified or chemically treated to achieve the same end. (The latter was the subject of a forthcoming publication.)

The problems raised by the formation of 'water of reaction' during the condensation had led Dr. Pinazzi to undertake the study of condensation reactions of methylol derivatives in organic solution and in the presence of certain elastomers. The results of this work, he considered, should tend to prove that chemical reactions do in effect take place between the compounds (I) or (II) and certain rubbers, and should give rise to properties analogous to those obtained in rubbers reinforced with carbon black.

Urethane Foam Process

THE 'Urethane foam process' was described by Dr. J. T. Watts. He reviewed briefly that a urethane was formed by the reaction of an isocyanate with an organic material containing hydroxyl groups. In the presence of a catalyst, the reaction was rapid. With water, in the presence of a similar catalyst, an isocyanate reacted rapidly to produce carbon dioxide and a substituted urea. When these reactions were arranged to take place simultaneously a non-thermoplastic, crosslinked foamed product was obtained. The type of foam was controlled by the type and quantity of raw materials used; variations being obtained from soft flexible foams to hard rigid structures. The cell structure could be modified by suitable additives. Useful hydroxy-containing compounds included polyesters and polyglycols, while preferred di-isocyanates included the mixed isomers of 2:4, 2:6 toluylene di-isocyanate and methylene bis (4 phenyl isocyanate).

Rigid foams could be made by mixing the ingredients with a bucket and paddle technique, but in the case of flexible foams, apart from small batches which could still be handled in individual containers, the high speed of reaction made continuous mixing machinery highly desirable. Typical output of flexible foam from a small continuous mixing unit was 7-15 lb./minute; at a density of 0.03 to 0.06, this represented a considerable volume of foam which had to be handled economically.

The ease of manipulation of finished foam into a variety of shapes by means of a red hot wire or high speed knife rendered fabrication, after foaming, attractive and considerable commercial development was proceeding on these lines. Adhesive union presented no difficulties, said Dr. Watts. In particular, a sprayed layer of the foaming composition gave a soft flexible union.

The high speed of the foaming and curing reaction in the case of flexible foams made them easy to apply by spraying.

Polymer Deformation

Chemical reactions which might be induced by applied deforming forces during processing operations on polymers such as masticating, milling, extruding, and moulding were considered by Dr. W. F. Watson ('Chemical reactions induced by polymer deformation'). The reactions said Dr. Watson, were a direct and not an incidental result of the mechanical energy imposed, molecules of the polymer being torn into fragments with reactive (free-radical) ends.

He reviewed a mechanico-chemical mechanism for rubber mastication and its experimental support and considered the participation of oxygen and other radical acceptors. Degradation of a wide range of polymers, including those not rubber-like at normal temperatures, under the action of deforming forces was shown to occur.

Dr. Watson said that knowledge on the chemical effects of mechanical energy could be exploited in control of processing and in suggesting novel types of reactions of polymers. The formation of block polymers from polymer blends and polymer-monomer mixtures was exemplified.

Radiation Processing

Some of the beneficial modifications of polymers which have already been achieved using high energy radiation were described by Mr. T. Bain and Mr. W. H. T. Davison, in 'Radiation processing' together with the various types of radiation and radiation sources which can be used. Particular emphasis was given to the irradiation of polythene.

At present, the authors said, electron accelerators were considered the most practicable sources of radiation for processing polymers. A detailed description of the characteristics of a Van de Graaff electron accelerator was given. Practical aspects of processing various types of products (such as electrical components, film and cable) were outlined and estimates of production capacity and irradiation cost for this type of machine were given. It was stated that while irradiation processing was still in the development stage and consequently relatively expensive it already had a number of commercial applications. It was Bain and Davison's opinion that these applications would expand rapidly in the future as experience in the field was gained and cheaper irradiation sources became available.

Elasticity of High Polymers

In a consideration of 'The rubber-like state' Professor G. Gee, said that we were far from having a full understanding of the several deviations from the ideal rubber-like state, but qualitatively they could all be interpreted in terms of two independent properties of a polymer: its inter-molecular forces, and the flexibility of an individual molecule. Regrettably there was little quantitative information about these factors, but work now in progress should add usefully to our knowledge. The general objective was to relate the physical properties of polymers with their chemical structures.

Professor Gee stated that the equilibrium theory did not explain why high elasticity was not a universal characteristic of high polymers. In practice, at least three types of limitation were observed: (1) at sufficiently low temperatures a rubber was transformed into a glassy state; (2) some polymers were able to crystallise spontaneously within certain temperature limits, and this tendency could be markedly increased by any deformation of the rubber which induced molecular orientation and (3) no rubber behaved in an ideally elastic manner under dynamic strain.

UCL CHEMISTRY LAB HOLDS DINNER

'Valuable Aid from Industry' says Sir Christopher Ingold

Professor Nyholm, professor of chemistry, University College, Lady Ingold, Professor Sir Christopher Ingold (standing), Lady Goodeve, Mr. Sidney Barratt, managing director, Albright and Wilson Ltd., Dame Kathleen Lonsdale, head of crystallography department, University College

A DINNER of the University College, London, chemistry department laboratory, held at the College on 25 February, was attended by a distinguished company. The chairman was Professor Sir Christopher Ingold, professor of chemistry and director of chemistry laboratories, University of London, University College.

Guests at the dinner included Sir Charles Goodeve, director, British Iron and Steel Research Association and president, chemistry section, British Association, and Lady Goodeve; Dr. F. H. Green of the Wellcome Foundation; Mr. W. A. Dickie of British Celanese Ltd.; Mr. L. Farrar-Brown of Nuffield Foundation; Dr. W. G. Hiscock, director, Imperial Smelting Corporation and Consolidated Zinc Corporation Ltd.; Mr.

Sir Charles Goodeve

H. L. West of Esso Petroleum Co. Ltd., and Mr. A. Munden, chief of research section, British Nylon Spinners Ltd.

Professors and lecturers also attending the dinner included Professor Dame Kathleen Lonsdale, head of the department of crystallography of the College; Professor R. S. Nyholm, professor of chemistry; Professor E. D. Hughes, professor of chemistry; Dr. R. J. Gillespie and Dr. M. L. Tobe.

The toast 'The Lab' was proposed by Sir Charles Goodeve, who offered sincere congratulations regarding the recent honour conferred on Sir Christopher. (He received his knighthood in this year's New Year's Honours List—see CHEMICAL AGE, 4 January, p. 13.) This honour gave satisfaction on all sides and it was very much appreciated.

The 'Lab' dinner was a nostalgic occasion, said Sir Charles, with the inevitable 'What have you been doing these last 20, 25, 30 or 40 years?' He was attending the dinner for the first time in many years. He recalled a previous occasion when he was then an underpaid member of the staff. The dinner then had been a 'rowdy' affair

A question in all minds on this occasion was, suggested Sir Charles, 'What is the "Lab" like today and what is it going to be like tomorrow?' He referred then to the number of Australians at present studying at University College.

He couldn't imagine why they left that country, which he had an opportunity of visiting during his recent Commonwealth tour. When he had visited India, he had learned that without the knowledge the Indians had gained from this country, they could not have begun to tackle their problems. Sir Charles said that he had been told in India that they did not want goods, but they wanted equipment and know-how.

Another matter which had struck him forcibly was the great rise in the standard of scientific research in the Commonwealth and Canada. It had changed out of all recognition in the last 20 years, and particularly since the war. He thought that this change had come about through better communications.

Sir Charles noted that the British Isles were now more in the centre of the world than ever before. Also some 92 per cent of the world's population was covered by air routes. There was a need for a centre of scientific research, and London, which had always been a centre of research, was even more a centre today. At University College, for instance, some 30 per cent of its research students were from the Commonwealth.

Replying to the toast, Sir Christopher Ingold said that he saw before him teams which represented four decades—namely of the 20's, 30's, 40's and 50's.

He recalled that Sir Charles, when a lecturer at UCL had had most of his students in the long room and Lady Goodeve, also a lecturer, had lectured nearby.

Sir Christopher then referred to the guests present that evening. All were benefactors of the 'Lab.' He would also include in this, past members of the chemistry department, such as Major Dr. F. A. Freeth and Mr. M. A. T. Rogers, now of Imperial Chemical Industries. Such people had helped UCL in two main ways. They had helped to keep people together and by giving apparatus to the department that UCL could not have otherwise afforded. They had thereby assisted in raising the quality of work far above that which could otherwise have been done. As an instance of this help Sir Christopher mentioned the latest trifle UCL had received—namely the £17,000 Varian nuclear magnetic resonance spectrometer. He also said he was at present working on a report regarding the need for a new laboratory.

Dr. W. G. Hiscock, Imperial Smelting Corp.; Dr. R. J. Gillespie, lecturer, University College chemistry department; and Dr. F. H. Green, Wellcome Foundation

Chemist's Bookshelf

Account of 'Big Business in the Making' by Dr. Haber

THE CHEMICAL INDUSTRY DURING THE NINETEENTH CENTURY: A study of the Economic Aspects of Applied Chemistry in Europe and North America. By *L. F. Haber*. Oxford University Press. Pp. x + 292. 45s.

This book on the 19th century chemical industry by the son of Fritz Haber is the most comprehensive study of its subject so far put before the English reader. Dr. Haber has brought into a series of easily read chapters most of the published information on the development of chemical enterprise in the more important European countries and in the US. In defining the main scope of his book the author states his intention of concerning himself, on the heavy chemical side, largely with the history of sulphuric acid, soda ash, caustic soda and bleaching powder, and, on the organic side, with the dye industry.

Regrettable

His dismissal of explosives in barely two pages seems regrettable. Both the explosives industry and the electrolytic alkali-chlorine industry, to which Dr. Haber also gives scant notice, had at least the importance in the 19th century that they were the beginnings of developments of the greatest consequence in the present century.

Perhaps the most valuable sections of Dr. Haber's book are those dealing with the rise of chemical manufacture in France, Germany, Switzerland, Belgium, Austria and Czarist Russia. The account, in the chapter on 'Big business in the making', of the growth of the German dye industry and in particular of the 'Little IG' and the later 'Erweiterte IG' is of great interest at the present time, in view of the importance of the German industry. Later Dr. Haber explains the significance of such bodies as the Vorstand and the Aufsichtsrat, as well as of the Prokura system.

In dealing with the American industry he has obviously relied heavily on Williams Haynes' encyclopaedic work. Incidentally, by 'North America' the author means the US only. In a short chapter on the 'New technologies' the origins of the Solvay soda process, dye manufacture, the explosives industry, and brine electrolysis are briefly dealt with. Since he has not elected to deal with electrolysis *in extenso*, the inaccuracies in Dr. Haber's account of its technical history should not be too harshly regarded.

For the record let it be stated here that such statements as: 'Matthes and Weber were the first to electrolyse brine in a diaphragm cell', 'Kellner patented a mercury rocking cell', 'In Britain Hargreaves and Bird devised a cell incorporating similar principles' (to LeSueur's), and 'Electrochemistry was very much an American development' are categorical errors.

Dr. Haber deals at greatest length with British chemical manufacture. For reasons not instantly obvious he sectionalises his account of it into the periods 1800–50, 1850–70, and 1870–1900, none of which correspond to the duration of any actual phase in the history of the industry. At the outset the now thoroughly exploded fallacy of the inhibiting effect of the salt duty on early British chemical enterprise is uncritically retailed. As the account is continued and the Leblanc system nears its zenith and the beginning of its decline the impression is conveyed that the British industry reached the end of its first century in a very desperate state indeed.

While rightly recognising the great ability of the management of the United Alkali Co.—for a time the largest chemical enterprise in the world—Dr. Haber considers they failed in their mission of reviving the Leblanc process. What, in fact, that often criticised concern did was to conduct a not too disastrous transition from the old to the new technologies and, in the next century, after almost four decades of holding the heavy chemical front, it brought into the Imperial Chemical Industries merger of 1926 a very much more important industry than would have survived had the manufacture remained in the hands of family businesses.

Failure of this country to support a large dyestuffs industry and to follow up the brilliant initiative of Perkin and his few successors completes the somewhat depressing picture of our chemical industry towards 1900.

In two chapters Dr. Haber deals with the state of scientific education up to about 1840 and from about that year to the end of the century. The first of these periods lies well within the first stage of development of the heavy chemical industry, when empirical techniques and recipes prevailed in the factories and pure science had no significant influence on industrial practice; towards the end of the second period scientific training had become necessary to staff the research laboratories and factories engaged in the new organic branch of chemical industry—the manufacture of dyes and pharmaceuticals. Dr. Haber fails to bring out the difference between the kind of science that was useful in the heavy chemical industry and the compound-proliferating activity of the organic chemists.

It is an over-simplification that lack of scientific education was the main factor depressing development of our chemical industry, particularly the dyestuffs branch. It was, after all, in this backward England that the first important aluminium and sodium manufactures were established, and the mercury cathode electrolytic chlorine-caustic cell, the drained-cathode diaphragm cell, the Mond-Langer nickel carbonyl, the Castner cyanide and peroxide processes were invented. In a free-trade England with vast trades in textiles and coal, it no doubt seemed good sense to ship tar to Germany and to import such specialist minor ancillaries as artificial colours; and if industry needed some of the products of German 'Wissenschaft', they could be imported too—as, indeed, they were!

Histories of the chemical industry are few, remarks Dr. Haber in his Introduction: of the few that have been produced we have no hesitation in placing this one in the front rank. Its publication is yet another reminder of the fact that the history of the chemical industry in the present century remains to be written. Never has the need for an understanding of the nature of the chemical industry been more urgent than it is today.

D. W. F. HARDIE

LITTLE USED ORGANIC TECHNIQUE

ORGANIC ELECTRODE PROCESSES. By *Milton J. Allen*. Chapman and Hall, London, 1958. Pp. xiv + 174. 32s.

The principles of electrolytic oxidation and reduction have been established for well over a hundred years and in the second half of the last century, Kolbe, Haber and other workers used electrolytic methods of oxidation and reduction of organic compounds. In spite of this, electrochemical methods have not been fully adopted by organic chemists, perhaps because few modern books on the subject are available. In this comprehensive monograph the author has covered much of the field of organic electrochemistry in a concise and effective way.

A first chapter covers general considerations. Concepts such as polarisation, electrode potential, overpotential, catalytic effects of electrodes and the influences of variations in agitation, temperature and time are briefly discussed and explained. This section might perhaps be profitably expanded in a future edition. Instrumentation and techniques of electrolysis are clearly and fully discussed in a further chapter which contains some very clear photographs and diagrams. Many of the methods and technical details given are clearly the products of the author's practical experience.

The remainder of the book is concerned with the mechanisms and processes of organic electrochemistry. Of three chapters on cathodic reduction, the first deals briefly with mechanisms and theories and with the reduction of nitro-compounds, imides and imidic esters. Cathodic reduction of such carbonyl compounds as aldehydes, ketones, carboxylic acids, and miscellaneous cathodic reactions, including reduction of unsaturated compounds, alkaloids, sulphur and arsenic com-

pounds, dehalogenation and desulphonation, from the subject matter of the two other chapters.

Anodic oxidation is treated in a similar way. A detailed consideration of the oxidation of fatty acids and their salts follows an outline of mechanisms and includes the Kolbe reaction, the oxidation of single, mixed, unsaturated, substituted and dicarboxylic acids and electrolytic acetoxylation, aloxylation and alkylation. A chapter is concerned with the anodic oxidation of aliphatic, heterocyclic and aromatic compounds generally and includes methods of oxidation of such substances as alcohols, aldehydes, ketones, sugars and alicyclic compounds as well as brief accounts of miscellaneous aliphatic and aromatic oxidations. A final chapter is concerned with anodic substitution and deals with halogenation, thiocyanation, nitration and alkoxylation.

Concise Text

The text, though concise, contains the essential details of a wide range of electrolytic organic reactions and is supplemented by a large number of references to original papers and to patents. Possible mechanisms and theories are adequately discussed and clearly illustrated. Industrial applications and processes are indicated. The book contains information of great value to the organic chemist, whether engaged in research or industry. There is much of interest to physical chemists. With the increasing cost of conventional reducing agents the chemist concerned with the manufacture of organic chemicals may find it particularly useful. The price, for a book of this type, is very reasonable.

W. R. MOORE.

Comprehensive Chemistry and Physics Handbook

HANDBOOK OF CHEMISTRY AND PHYSICS. Edited by *C. D. Hodgman, R. C. Weast* and *S. M. Selby*. 39th Edition. Chemical, Rubber Publishing Co., Cleveland, Ohio, US. Pp. xxii + 3213.

Comprehensive mathematical, physical and chemical tables are contained in the latest edition of this well-known handbook.

New information added includes a table of nuclear spin and a table of relative sensitivities which relates the nuclear magnetic resonance of certain nuclides to that of the proton. Two tables listing the superconductivity of some metals, alloys and compounds near the absolute zero have also been added, together with tables giving the energy, mass and velocity relations for the electron, data of magnetic properties of certain transformer steels, and information about various sugars.

The table of isotopes has been extended and revised and information on the transuranic elements up to 101 has been added. A further addition is new tables containing the dielectric constants of pure liquids and the dielectric constants and dipole moments of substances in the gaseous state.

J.P.S.J.

Chemist's Bookshelf

Extraction Methods in Analytical Chemistry

SOLVENT EXTRACTION IN ANALYTICAL CHEMISTRY. By *George H. Morrison* and *Henry Freiser*. Chapman and Hall, Ltd., London: John Wiley and Sons, Inc., New York. 1957. Pp. xi + 269. 54s.

Dr. Morrison and Professor Freiser have done a notable service to analytical chemists by this timely book. The increasing use of extraction methods in analytical chemistry during the past few years have put this method of separation on a plane of importance such that (although not yet rivalling the classical procedure of precipitation) it must be regarded as a major separation method.

The partition of a solute between two immiscible solvents has been studied from the physicochemical point of view over many years. Its significance for the analyst has been emphasised latterly in the powerful separations devised in the field of partition chromatography; these latter have served, perhaps, to conceal the fact that a much simpler series of separations is possible, amenable to more straightforward theoretical treatment than is possible in partition chromatography, and as practical procedures, equally powerful if less spectacular.

Twenty years ago the analyst could perhaps have quoted the ether extraction of iron-III chloride and uranyl nitrate, and the separation by organic solvents of the alkaline earths as examples of extraction techniques applied to inorganic analysis, and probably would then have come to a dead end. Yet, as the present authors show, 80 per cent of the elements, in one form or another, are extractable by organic solvents; not only extractable, but capable of being separated with some degree of selectivity. This is clear indication that extraction must take its place as a method meriting serious consideration in every new problem involving an inorganic separation; and indeed in every reconsideration of the validity of existing separation using other principles.

This book is divided into four major sections. In the first part the general theory of extraction is presented, and is then discussed in terms of the systems found to be most useful in practice—that is, systems involving various types of metal complexes. Part 2 deals with the apparatus and techniques used for both batch and continuous extraction. Part 3 develops the general theory of Part 1 by a detailed consideration of each of the extraction systems so far proposed, these being arranged under the two headings of ion-association systems (e.g., the chloride system, which involves no less than 20 elements in addition to the iron-III chloride system already mentioned) and chelate systems (e.g., thenoyltrifluoroacetone, dithizone, cupferron and the like). Altogether, over 30 systems are dealt with.

Selected Procedures

Finally, selected procedures are given for individual extraction of about 65 elements in addition to the lanthanons. In some cases only a single method is described, but for quite a range of elements four or five methods are available. A useful appendix gives in tabular form the properties of organic solvents of value in extraction procedures—about 100 solvents. And one has only to glance down the six-page index of extraction of the elements to realise that extraction is an analytical procedure that is here to stay.

The authors have given us a readable

Chemical Engineering Practice

Volume 4—Fluid State

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Chemist's Bookshelf

book, an interesting book, and a valuable addition to the literature of analytical chemistry. Having said this, it may be permissible to voice the very mildest of reproaches. Nowhere, repeat nowhere (as far as the reviewer can observe), have the authors suggested (1) that extraction ranks as a quite respectable classical method in the hands of the organic analyst, or (2) that this book concerns itself solely with inorganic analysis!

CECIL L. WILSON.

Annual Review is Mainly Physics

ANNUAL REVIEWS OF NUCLEAR SCIENCE. Volume 7. 1957. Edited by *J. G. Beckerley* in association with *R. Hofstadter* and *L. Schiff*. Annual Reviews Inc., Palo Alto, California, US. Pp. 496. $7.50 post paid.

Volume 6 in this series was reviewed under the heading 'Nuclear Science for Physicists' (CHEMICAL AGE, 16 March 1957, page 473). This heading is even more applicable to the present volume which, the preface suggests, has returned to the balance of the earlier volumes. Only 30 pages are devoted to articles on radiochemical separations by ion exchange and the available equipment for radiochemical work. Four chapters, taking 140 pages, give comprehensive reviews of aspects of radiobiology, a field of vital interest to everyone. But the book begins and ends with articles on mesons. A third of the volume is allocated to high energy electron reactions and collective model theories of the nuclei. Thus, most of its content is of highly specialised physics.

The section on radiochemical separations by ion exchange is principally concerned with the separation routes. Theoretical aspects of the exchange are not reviewed. Materials and techniques are briefly covered. Because of the spate of articles within this field, the reader is commended to nine books and 12 review articles for wider considerations beyond the 137 references otherwise referred to. Decreasing separation times and controlled elutions with shallow beds offer valuable possibilities for the purification of short-lived daughter activities. The method has potentialities for refining isotopes with half-lives as short as the order of milliseconds. Radiation damage of the resins precludes the use of this technique for high activity separations.

Safety is of foremost importance, emphasises the article on equipment for high-level radiochemical processes. The need for policy decisions as to the level of activity and type of work to be undertaken and the need for the provision of suitably shielded areas and for localisation of operations in order to prevent the spread of contamination are stressed. All operations must now be carefully planned and first tested with inactive materials. Only much careful forethought can prevent loss of efficiency even with simple remote operations. Accidents are very costly.

The article makes reference to many constructional materials, the problem of viewing operations within a shield, handling techniques and several other topics. The review was probably completed before publication of the 'Code of practice for the protection of persons exposed to ionising radiations' by HM Stationery Office in 1957 for no reference is made to it. The two together are a useful introduction to the precautions and techniques necessary for radiochemical processes. The dust cover of volume 6 suggested that the instrumentation of highly radioactive processes would be reviewed but this article does not consider this aspect.

Volume 8 is advertised to contain articles on 'Nuclear chemical engineering' and 'Solvent extraction in radiochemical separations'. The hope that, amid the legitimate preponderance of articles on nuclear physics, there will be one on the corrosion of constructional materials within reactors is now deferred until 1959.

J. S. M. BOTTERILL

Materials for Chemical Engineers

ENGINEERING MATERIALS HANDBOOK. Edited by *C. L. Mantell*. McGraw-Hill Publishing Co. Ltd., London. 1958. Pp. xxxii + 2,000. 167s.

Under Dr. Mantell's editorship 150 authors have contributed to this volume which sets out to supply 'an authoritative work on engineering materials.' It is divided into 43 sections of which the first, 'Properties of materials,' is a glossary of terms used in engineering and related subjects.

Other sections discuss such subjects as the uncommon metals (e.g. beryllium, tantalum, titanium and zirconium), electroplated coatings, carbon and graphite, hydrocarbon-base materials, rubber and elastomers, plastics, organic coatings, glass and silica, insulation, corrosion, materials of construction for the process industries, and pipe fittings and valves.

All the contributors are experts in their particular fields and the editor is chairman of the department of chemical engineering at Newark College of Engineering, New Jersey, US. The treatment throughout is detailed and there are many tables and diagrams. Readers in the UK may find the preponderance of American specifications a slight disadvantage.

Every chemical engineer should find this volume of the greatest value for obtaining accurate, up-to-date information on practically any constructional material.

J.P.S.J.

Essential Points of Rubber Chemistry

CHEMISTRY OF NATURAL AND SYNTHETIC RUBBERS. By *Harry L. Fisher*. Reinhold Publishing Corpn., New York. 1958. Pp. 192. 52s.

As the title implies, this book lays emphasis on the chemistry of natural and synthetic rubbers as distinct from their technology, though a certain amount must inevitably be included.

The author has attempted to condense the many facets of the subject into a small volume and has largely succeeded in achieving this. The essential points have been covered, though in some sections of the book only the barest information is given.

The major portion of the book is devoted to the properties of natural and synthetic rubbers, their chemical changes under various conditions and a useful comparison of physical and chemical properties. A detailed survey of the raw materials for synthetic rubber is made, giving a valuable account of the relative merits of the materials and the polymers resulting therefrom.

The chapter on synthetic rubbers gives a full and detailed account of the well-known and currently used elastomers, the methods of synthesis, including emulsion techniques, the structure and properties of the vulcanisates. The author, in addition, has described in full the less usual synthetic rubbers with specialised properties, the silicones, polyacrylates, coral and carboxylic rubbers, Hypalon, Vulcollan, Adiprene, sodium and potassium rubbers, the polyesters and polyurethane. The fluoro-elastomers Viton and Kel-F and their unique properties are also described.

There is also included a short account of graft and block polymers with an interesting conclusion to the chapter on inorganic rubbers — the polyphosphonitriles.

The chapter on hard rubbers and reclaim is very brief, but the nature of this book does not warrant more than a mention of these subjects.

Bonding rubber to metals and textiles is very complex and is dismissed far too briefly in this book and requires more space and detail to be devoted to it.

Although well known, the account of the history of natural rubber, its discovery and development has, nevertheless, been given an interesting presentation and includes a summary of the types of known natural rubbers, an analysis of rubber latex with some practical details of tapping the plantation trees, the *Hevea brasiliensis*.

The account of the independent discovery of vulcanisation on both sides of the Atlantic is given fairly, but leaving no doubt in the reader's mind as to who was first.

(*Continued on page* 456.)

DEVELOPMENTS IN PROTECTIVE COATINGS

Special Chemical Age Review

DEVELOPMENTS in the paint industry in recent years have produced a very wide variety of new materials and coatings. In many instances with more information to hand with regard to properties, formulations and uses, once-rare materials are now becoming standard.

Thus thixotropic alkyl resins, which give paints that in the container set to a solid gel, but which flow on readily without sagging or dripping, are at present arousing considerable interest. The finishes obtained with these are not always of the quality of conventional paints, so more development work on these is expected. 'Two-package' coatings are now proving more acceptable.

Expansion continues in the latex or emulsion paints. These latex paints are now being used on exterior surfaces. They are the preferred coating for masonry and some, it is suggested, may be suitable for outside wood-work, although this is very much in its early stages at present.

Water-thinned paints have been suggested for industrial products finishing. Reduced fire hazard and reduced cost are the main appeal here.

Work is in progress to develop paints with suitable fire-resistance, that is, retardation of spread of flame and prevention of the substrate reaching its ignition temperature. Up to date, these paints have suffered from lack of adequate coating properties but investigations into these are continuing.

Atmospheric Corrosion

Of importance in plant and industrial maintenance is the protection of metals from atmospheric corrosion. This is of even greater importance in chemical plants. Suggestions being developed in this field are the use of highly resistant paints and the selection of coatings, each of which provides protection against a particular attack problem.

Marked interest has been shown in epoxy resins, particularly those incorporating phenolics, amines or amides and catalytically cured. Their usefulness lies in the fact that cure is effected without oxidation or solvent loss, thus allowing the application of thick coatings.

Epoxy resins: These are now being used as modifiers for many of the more usual resins. Thus resins have been prepared which are used as primers and general utility vehicles from epoxy modified rosin esters, epoxy resin-tall oil, phthalic alkyds and various modified epoxy rosinate varnishes.

Fatty acid esters: Such esters with epoxy groups have been developed as plasticisers for polyvinyl acetate compositions and polyvinyl copolymers for latex formulations.

Vinyl polymers: Recent developments such as hot spraying and use of mastics are claimed to increase the value of vinyl polymers (i.e. the chloride and acetate) by allowing users to put on two coatings of adequate thickness rather than the five or more previously required.

By copolymerising vinyl stearate with vinyl acetate, a new copolymer has been produced which gives tough flexible films with marked water resistance.

Urethane coatings: Relatively new also are the urethane coatings derived from polymerised *iso*cyanates. They have been considered as particularly suitable for use on high-speed aircraft.

Chlorinated rubber paints: Such paints offer marked advantages being particularly suitable for interiors of factories and other buildings where the atmosphere is chemically laden; for exteriors of buildings in industrial areas; or exposed coastal positions; or for application to surfaces such as concrete, plaster or asbestos cement.

Longer Life Claimed

According to reports chlorinated rubber paints have a longer life than standard oil paints under the same conditions, although the cost is similar. They are stated to be very suitable for application to metal and other surfaces and their use in underwater works would repay study.

Although chiefly protective the chlorinated rubber paint has a decorative value and is available in a wide range of colours. Used as an alternative to an oil base for a variety of paints, it is plasticised, still further stabilised, dissolved in a suitable solvent mixture and pigmented with appropriate pigments. The paints are non-inflammable when dry.

Chlorinated rubber based paints are alkali resistant. Also, acid resistance is of a higher order than conventional paints, and non-saponification and impermeability make them more resistant to brine or salt. Combined with zinc dust, chlorinated rubber provides an excellent primer for application to metal surfaces. A low-temperature resistant chlorinated rubber paint is produced which withstands temperatures down to —60 °F while still retaining its characteristic flexibility.

The suitability of chlorinated rubber paints for various surfaces has been examined, and in particular for application to asbestos cement which contains a certain amount of free alkali brought to the surface by drying out of moisture. This alkali attack results in the paint failures on this surface when standard paints are used. The same improved decorative and protective advantages apply to the use of chlorinated rubber paints on concrete surfaces. Also, plaster surfaces may be painted with chlorinated rubber paint after 14 days have elapsed to allow for hydration and carbonation.

Painting of bricks with chlorinated rubber produces a satisfactory decorative appearance. On old brickwork which is porous, it provides a dense film.

A chlorinated rubber medium, combined with zinc chromate is claimed to be an excellent primer if applied to clean, rust-free surfaces of ferrous metals. For non-ferrous surfaces, etching is usual, followed by chlorinated rubber zinc chromate metal primer. Other rubber-like materials which have been considered include polysulphide polymers, polybutadiene, cyclo-rubbers and neoprene.

Latex paints: Very much in the news at present are the latex paints. Among the most popular appear to be styrene-butadiene, polyvinyl acetate and acrylic latex. A just-introduced acrylic latex for paint formulations by Rohm and Haas, Rhoplex AC-55, uses the company's standard acrylic polymer with a different emulsifying system. The emulsion is made in an anionic emulsifying system and is lower in viscosity than the standard Rhoplex emulsion. The makers state it shows little, if any, tendency to stratify on standing. This new acrylic latex is also said to have unusually good compatibility with various film-forming materials and thickening agents. Fair compatibility has been achieved with emulsified linseed oil and emulsified alkyds, and it is claimed that it is completely compatible with hydroxymethylcellulose, various Acrysols (A-1, ASE-60, ASE-75 and G-S) methyl cellulose, casein, and polyvinyl alcohol.

Stability to shearing action of Rhoplex AC-55 has been noted. It will also withstand rapid inter-particle impact and no coagulation has been observed after stirring for 10 minutes in a high-speed mixer. The emulsion itself or coatings made from it can be sprayed safely. Good freeze-thaw stability is reported. Addition of other materials, particularly certain pigments, may affect this freeze-thaw stability. However, this can be counteracted by the addition of polyhydroxy alcohols such as ethylene glycol. The new latex paint has also been shown to show no signs of coagulation when stored in a closed can for two weeks at 140 °F.

Tolerance Excellent

In comparison with other emulsions, it has been found that the tolerance for ketones and glycols was excellent. Another useful feature of this new latex is its excellent compatibility with aqueous tinting colours and universal tube colours ground in oil. It is also compatible with almost all types of white pigments normally encountered in water-based paints. The white pigments should be of the type which are stable under the mildly alkaline conditions needed in these paints. Moreover, laboratory investigations have shown that pigment volume concentrations as high as 68 per cent are possible. This feature suggests that the emulsion will be useful in industrial primers, sealers and related coatings which are formulated to give optimum hiding power at low cost. It can be used for many different types of surface-coating formulations including clear and pigmented sealers for plaster, plasterboard, concrete, stucco, brick and other masonry materials. On short-term outdoor durability tests the indications are that this

new acrylic emulsion will have a performance parallel with the early acrylic emulsion paints.

Phenolics and furan resins: Improvements in baking phenolics have led to better flexibility and alkali resistance. Drawbacks at present for furan resins appear to be poor colour and extreme brittleness, but their value lies in their low cost and chemical resistance.

Fluorocarbons: The outstanding heat and chemical resistance of fluorocarbons such as polytetrafluoroethylene has been applied recently to protective paints by employing dispersions of polymers of the fluorocarbons in water, amyl acetate and ketones, which produce coatings on fusion.

Zinc-rich paints: Assessment of the new 'zinc-rich' paints appears to be difficult as yet. These consist of large amounts of zinc dust dispersed in a suitable binder. In the dry film they contain something like 95 per cent pigment and are believed to act partly through cathodic protection.

Speciality coatings: There is considerable interest in fire-retardant paints. Thus such a paint produced from isano oil has been described. Another is an intumescent coating made on a latex base. Polyester resins containing an adduct of a hexahalocyclopentadiene and a compound containing aliphatic carbon unsaturation have also been developed.

New phosphorus resins were also recently patented and these are stated to be proving useful as flameproofing compounds and plasticisers.

Heat-resistant Coatings

Developments in heat-resistant coatings based on organo-silicon resins have been directed towards improved flexibility. The latest of these, just announced by Imperial Chemical Industries Ltd., are DP 37 and 38. DP 37 is a flexible resin having outstanding heat resistance, long heat life, colour and gloss retention at high temperatures. The manufacturers recommend it for use in coloured finishes for service at 150°C to 250°C and state that it is of particular value in aluminium paints having good initial leafing and leaf retention for use at temperatures up to 300°C. This silicone resin has been found to be compatible with a limited number of organic resins and can be modified with them to give improved film hardness and toughness.

A new protective coating for metal and concrete surfaces has been developed in this country recently and is now available commercially. Known as Epimastic (Wailes Dove Bitumastic), it is said to combine the water-proofing properties of coal tar pitch with resistance to chemical attack and corrosion of epoxy resins. Excellent adhesion to both metal and concrete surfaces is claimed, and it is also said to be able to withstand exposure to acids, alkalis, oils, fats and many other corrosive chemicals. Excellent resistance to abrasion and other forms of mechanical wear or shock are also claimed. Its properties are retained over long periods, the manufacturers state.

Oils: Work on suitable oils for the industry has continued. Full-scale production has now been begun of British Oil and Coke Mills' Trokene, a new unsaponifiable derivative of vegetable oils. It is said to be unique in providing the first paint vehicle with a structure independent of ester linkages that is capable of drying by oxidation.

Several other new drying oils have appeared recently, which have been produced by modification of hydrocarbon oils with unsaturated polymers, e.g. butadiene. From mixed dimers of petroleum origin other drying and semi-drying oils have been made. A range of tung oils has been produced by hydrogenation, while vinyl-tolerance modified oils have been developed having low viscosity and high solids media suitable for incorporating cheap, odourless and low solvency solvents.

Pigments: Due to the increasing ease with which titanium oxide can now be obtained, this material has received greater attention of late. In particular the use of titanium oxide is indicated in formulations for a single-coloured undercoat for application under all pastel-shaded finishes. By roasting titanium oxide with chromates an olive-coloured titanium pigment has been obtained which is thermally stable.

Various new phthalocyanine pigments have been produced recently, and a metal-free β-phthalocyanine pigment of high pigmentary strength which does not revert to the α-form, has been reported.

Optical brightening agents, e.g. fluorescent pigments continue to be of interest. Latest of these are the carboxylic acid amides, urethanes or ureas of 4-amino naphthalene 1:8-dicarboxylic acid imides. These are obtained in the usual way from 4-aminonaphthalene 1:8-dicarboxylic acid imide or its N-substituted derivatives by reaction with carboxylic acid chlorides or anhydrides, phosgene, isocyanates, or chlorocarbonic acid ester. They fluoresce, especially in solution with a bluish to yellow colour upon irradiation and are stated to have high lightfastness.

Up-To-Date Standard Tests for Tar Products Published

CELEBRATING the publication of the fourth edition (1957) of 'Standard methods for testing tar and its products' in London on 27 February were the members of the Standardization of Tar Products Test Committee under the chairmanship of Mr. L. C. MacMahon.

It is seven years since the third edition appeared, and during that time the panels responsible for each section of the book have been engaged upon an extensive laboratory programme to test and improve existing methods and to evolve and standardise new methods and techniques. The new edition, in fact, represents a thorough revision of the 1950 edition.

New methods of test are given for refined tar, crude benzole, carboxylic and cresylic acid, naphthalene, creosote oil, anthracene and pitch. Revised methods are given for crude tar, refined tar, crude benzole, light and middle oils, refined lower boiling points, carboxylic and cresylic methods, naphthalene, tar bases, creosote oil, crude anthracene and pitch. Three former tentative methods have been adopted as standard methods.

A new section deals with accuracy and precision, and the precision of many of the methods has been established, the committee state, from the results of co-operative tests in at least eight different laboratories. Appendices have been revised and brought up to date. A particularly noteworthy feature of the new edition is the comprehensive index.

'Standard methods for testing tar and its products' is published by the Standardization of Tar Products Test Committee, Oxford Road, Gomersal, near Leeds, price £2 2s, postage 1s 9d extra.

Speaking at the luncheon held in London on 27 February to celebrate the publication of this fourth edition, Mr. MacMahon said that the committee was composed primarily of chemists active in the testing of tar and tar products together with experts on apparatus. Members of each of the panels actively checked standards. The committee was self-supporting, the proceeds from the last edition paying for the present edition, which had taken seven years to produce.

Chemist's Bookshelf

(*Continued from page* 454)

Methods of vulcanisation are described using materials other than sulphur or sulphur compounds. The action of such chemicals as polynitro-benzene, organic peroxides, diazo-amino benzene, quinones and others is also discussed.

Acceleration and antioxidation are dealt with very briefly, and it is felt that an enlargement of this section would be of benefit to the book. A list of the currently used accelerators and antioxidants is given covering the principal types.

The final chapter deals with chemical derivatives of natural and synthetic rubbers—chlorinated, brominated and hydrogenated rubbers with their properties and applications.

The book contains a large number of valuable references at the end of each chapter which will enable the reader to cover adequately the subjects where the detail is lacking in the text. It can be recommended as a very useful reference book to students and research workers.

L. BOTTOMLEY

Determination of Polyesters in Methacrylate Copolymers

The following corrections should be noted for the abstract on p. 393 of last week's issue: column 1: lines 11 and 12—the methoxyl group of poly (*methyl* acrylate); lines 26 to 29—Phenol as used in Easterbrooks and Hamilton's method(1) is *necessary since* experiments carried out *without* using phenol gave only two-thirds of the theoretical yield; lines 72 to 74—in a copolymer *known to contain* 9 *per cent.* Column 2: lines 1 to 3—for a copolymer known to *contain* 3 *per cent* poly (ethyl acrylate).

TENTH OCCA EXHIBITION

Preview of New Chemicals and Development Products

A WIDE range of new and improved chemicals for the paint and allied trades is to be shown next week at the tenth technical exhibition of the London section, Oil and Colour Chemists' Association. In addition a number of exhibitors will be explaining to visitors progress of current research work. These developments are referred to in this special preview of the exhibits.

The exhibition is being held at the Royal Horticultural Society's New Hall, Greycoat and Elverton Streets, London SW1, on 11 March (from 3 to 7.30 p.m.) and on 12 and 13 March (from 10 a.m. to 7.30 p.m.). Admission is free.

Araldite Range of Epoxy Resins

Properties and applications of the Araldite range of epoxy resins for the surface coating industry are to be shown by *Aero Research Ltd.* (a Ciba company), Duxford, Cambridge. Araldite 820-RH is a two-part formulation, consisting of a resin and a hardener, for cold curing finishes, or alternatively for finishes that cure rapidly at elevated temperatures. Coatings based on this line are recommended when rapid drying coatings with good chemical resistance are needed.

Lacquers based on 981-AB are said to have a relatively wide stoving range (i.e. 3 to 15 minutes at 240°C, or 40-80 minutes at 180°C). The cured lacquer films are tasteless and odourless and have good resistance to acids, alkalis and solvents; they are recommended for internal protection of metal containers, etc. *Stand* 58.

Reactive Esters

Prominence on the stand of *Alchemy Ltd.*, Brettenham House, Lancaster Place, London WC2, will be given to reactive esters based on fumaric acid and maleic anhydride. The butyl and octyl esters of maleic anhydride are now well established in the copolymerisation field, but a number of products are available for research and development work as chemical intermediates. In addition Alchemy will show an interesting range of solid plasticisers for use in adhesives, coatings and lacquers where heat sealing and moisture-proof properties are particularly required.

Information will be available on their standard range of phthalate, citrate and tartrate plasticisers. A complete range of naphthenate and octoate driers for paints and printing inks will be shown. *Stand* 51.

Alkali Silicate and Zinc Dust Film

Work designed to solve problems involved in marine paints that combine anti-corrosive and anti-fouling properties and corrosion prevention of steel at elevated temperatures in the atmosphere has been undertaken by *Amalgamated Oxides* (1939) *Ltd.*, Victoria Works, Dartford, Kent. Formulations which fulfil these requirements will be shown; they are mainly based on the inorganic film formation of alkali silicate combined with the protective qualities of Zincoli zinc dusts.

Exhibits demonstrating the protection of mild steel in conditions of varying temperature from cold to 500°C in the atmosphere will be on view, as will a range of zinc oxides and zinc dusts made by the company. *Stand* 54.

Melamine/Epoxy Copolymer Resins

Main exhibits of *BIP Chemicals Ltd.*, Tat Bank Road, Oldbury, feature the properties of the melamine/epoxy copolymer resins and the use of both urea and melamine formaldehyde resins etherified with *iso*butanol. Since the development of melamine epoxy resin BE 647, a more flexible variant, BE 649, has been produced. The excellent heat and light resistance of both resins will be demonstrated, as will panels showing the resistance of finishes based on these resins to detergents, dilute chemicals and salt spray. A working exhibit will consist of a salt spray cabinet containing a series of BE 647 and 649 based finishes.

Isobutylated melamine and urea formaldehyde resins can now be used in combination with alkyd resins as a basis for industrial stoving enamels having flash points above 73°F.

The acid catalysed alkyd/urea types of wood finish will be shown, also single pack insecticidal lacquers. *Stand* 22.

Cationic Chemicals Shown for First Time

The chemical division of *Armour and Co. Ltd.*, GPO Box 250, Lindsey Street, London EC1, are showing for the first time at the exhibition. They are exhibiting for the first time in the UK, a comprehensive range of cationic chemicals for use in the paint, pigments and printing ink industry. A new 18-chapter booklet on their use has just been published by the company.

The use of cationic chemicals is based essentially on the surface activity of the chemicals on the pigment/vehicle interphase. Duomeen TDO (the oleic acid salt of an aliphatic diamine) is described as one of the most versatile dispersion agents, reducing dispersion time drastically. Armac C (a water soluble form of cocoamine) is used for softening chrome green, ultramine blue and cadium pigments; it is also used for pigment flushing.

Armeen Z is an amphoteric product, which retains its cationic activity down to a pH of 3, and is therefore suited for softening and dispersing prussian blue.

Armour's cationic chemicals are also used as anti-settling agents, for preventing pigment floating, as flocculating agents, in the formulation of emulsions paints, paint strippers, paint brush cleaners, etc. To cause bituminous coatings to adhere firmly to iron, even under wet conditions, Duomeen T is added to the paint. For the same purpose Duomeen TDO is used in certain primer paints. *Stand* 71.

New Bentone Product from F. W. Berk

Bentone will be the main feature on the stand of *F. W. Berk and Co. Ltd.*, 1-19 New Oxford Street, London WC1. In addition to Bentone 18-C and 34, information on the new Bentone 38 will be available. Bentone 34 and 38 are made by the associated company, Abbey Chemicals Ltd.

The three grades give similar properties to organic systems and the nature of those systems governs the grade to be used. These properties include improved pigment suspension, control of floating and flooding and sag prevention. Bentone is temperature stable and will therefore control flow during high temperature curing or baking cycles. Rutile titanium dioxide paints containing Bentone 34 have passed tropical storage tests of 12 months at 120°F. In addition to surface coatings, Bentone can be used in printing inks mastics, adhesives, lubricating greases etc. *Stand* 37.

Development Projects by ABRAC

Products in the course of development that will be shown by *A. Boake Roberts and Co. Ltd.*, London E15, will include: a new type of rare earth drier with interesting properties and which is 'likely to be marketed at a lower price than other driers of this class'; triaryl borate, an improved heat exchange fluid; aryl phosphates for use as hydraulic fluids; lubricant additives based on epoxy compounds; alkyl diesters for use as synthetic lubricants, including Pliabrac 989, a recently developed ester of comparatively low cost.

Main feature of the stand will show the applications of Abrac 'A', an epoxidised vegetable oil, and will illustrate advances made during the last year. The exhibit will indicate how Abrac 'A' may be used both to improve and to lower the cost of anti-corrosive primers and to give better adhesion to metals. A recent development of interest is the use of this product in the manufacture of epoxy resin esters, where it not only lowers the overall cost but also gives improved properties.

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Information will also be available on the use of Abrac 'A' in the manufacture of improved drying oils, polyester resins, epoxy potting and casting resins and in alkyds. *Stand* 1.

Progress With Trokene

Since introducing Trokene, a new unsaponifiable derivative of vegetable oils, at the exhibition last year, *British Oil and Cake Mills Ltd.*, 2 Kingscote Street, London EC4, have made progress in three directions; considerable light has been thrown on the chemistry of the reaction; manufacture has been transferred from pilot plant to full-scale production; more information has been obtained on the modification of the products and their possible industrial applications.

Still in an early stage of development, these materials are said to be unique in providing the first paint vehicle with a structure independent of ester linkages that is capable of drying by oxidation.

Trokene is produced in the form of dark-coloured viscous oils that bleach on drying and which dry by the same mechanism as natural drying oils, but being free from ester groups, they are not destroyed by caustic alkali. The rate of drying in the presence of normal quantities of driers is comparable to that shown by stand oils, but the hardness and gloss of the dry films can be matched only by oleoresinous varnishes or alkyds. As bleaching occurs during air-drying, Trokene, in spite of its dark initial colour, can be used as media for paints of all colours, except pure white. *Stand* 61.

New Isosebacic Acid

Chemical interests of the Distillers Co., are to be represented by *British Industrial Solvents Ltd.*, and *Honeywill and Stein Ltd.*, Devonshire House, Piccadilly, London W1, on a joint stand.

The BIS contribution is in two classes: the results of investigations on the fundamental properties of compounds used in the paint and allied industries; and the application of Bisol materials in established and new techniques. Under the first heading, the evaporation rates of some high-boiling solvents have been determined at a relatively high temperature (150°C); these results will be of particular interest to those concerned with heat-set printing inks and heat-dried finishes.

Under the second heading, BIS will report the final stage in a planned series of experiments on solvent evaporation. To be shown are the results on evaporation from standard lacquer films, composed of nitrocellulose, resins, and solvent mixtures of various types. Conditions during the range of 60-80 per cent evaporation, at the stage of film 'set-up,' govern much of the final appearance and physical properties of the dry film, and the preponderance of an active solvent during this period results in improved blemish-free finishes. It is established that, using an ester mixture, the ester remains far in excess of the diluent during this critical stage, whereas with ketones, the ketone : diluent ratio approaches 1 : 1.

The advent of the airless spraying technique has meant a drastic revision in lacquer formulations. In this method the lacquer is 'atomised' by high pressures, and high temperatures. Low boiling solvents with high vapour pressures are therefore required, and a selection of suitable solvents from the Bisol range will be displayed.

Among new compounds displayed will be Bisoflex 108A (an adipate of mixed alcohols), the latest addition to the Bisoflex range of plasticisers for p.v.c. and vinyl copolymer resins. Its outstanding low temperature properties will be demonstrated.

The *Honeywill and Stein* display will include sebacic acid and *iso*sebacic acid, the latter now available in this country for the first time. This new and, so far as British industry is concerned, relatively untried acid gives rise to esters which are economical in price and yet have plasticising powers similar to the well-known sebacates. *Stand* 20.

Work on Homopolymers and Copolymers

Development work on homopolymer and copolymer vinyl acetate emulsions will be shown by *British Oxygen Chemicals Ltd.*, Cleveland Row, St. James's, London SW1. This is devoted to investigations of the properties of copolymer emulsions compared with conventional homopolymers with respect to plasticisation equivalence, effect of heat on weight and flexibility of resin films, application and tinting characteristics and pigment binding capacity.

Gel emulsion paints have been produced by a novel method and will be demonstrated by showing the rate of build up of gel strength, effect of stirring and tinting and application characteristics.

BOC are agents for Tennessee Products and Chemical Corporation for the sale of benzo-guanamine and will demonstrate alkali and heat resistance, initial gloss etc. Samples will be available soon after the exhibition. *Stand* 24.

Resins for Stoving Finishes

Stand of *British Resin Products Ltd.*, Devonshire House, Piccadilly, London W1, will be divided into three sections. The largest will be devoted to resins used in the manufacture of stoving finishes and will suggest formulations for stoving undercoats and finishes.

Another section will feature Epok A150/50, a versatile alkyd resin. Examples will be shown of its use in air drying and stoving finishes and air drying and stoving primers. The third section will display Epok coumarone resins. Formulations of numerous media will be given as well as the corresponding paint formulations. These include: acid/alkali resistant paints; concrete or plaster primers; aluminium paints; high temperature resisting aluminium paints; undercoat media. *Stand* 26.

Increasing Use of Titanium Pigments

An improved supply of titanium oxide is freeing restrictions on the use of this material, the pigment of which has not been available in sufficient quantity to allow the optimum pigmentation of all lines. The exhibit of *British Titan Products Co. Ltd.*, 10 Stratton Street, London W1, will indicate the extent to which the titanium pigment content of paints may be increased to obtain the best results. Exhibits will be confined to air drying systems of gloss, undercoat and flat wall paints.

The possibility of obtaining one coat 'hiding' with white gloss paints over undercoats of varying colour and reflectance will be examined with respect to pigment content. In gloss paints also, the effect will be demonstrated of making pastel shaded paints with increasing amounts of titanium oxide. Rutile and anatase pigments are compared for hiding power at equal pigment/binder ratio and at equal cost.

In flat wall paints, the type of extender, titanium pigment content, and the total p.v.c. of the paint are varied to show their effect on hiding power, over a range of differently coloured backgrounds. Reference will be made to the difference between the wet and dry hiding power of paints.

Finally, it will be shown how a single coloured undercoat can be formulated for use under all pastel shaded finishes. *Stand* 28.

Drier Activation and Solventless Coatings

New developments to be shown by *Cray Valley Products Ltd.*, St. Mary Cray, Kent, will cover three aspects of paint technology: Drier activation; solventless coatings; and inhibition of gas checking.

The effects of drier activation have been examined systematically and although a good deal of work still has to be carried out in this field the interesting results so far achieved are said to warrant continuation of this work. Activators are particularly useful if used in conjunction with manganese and, in certain systems normally subject to drier absorption, a manganese/activator combination will often be preferable to a conventional cobalt or mixed naphthenate driers system.

The exhibit on solventless coatings will be confined to systems based on epoxy resins. Low viscosity polyamine resins, now available in experimental quantities, make it possible to produce air drying or stoving finishes with all the outstanding features associated with the epoxy/amine systems but without the toxicity hazards associated with the use of amines. Gas checking in foul ovens is still a common problem in the industry and the experimental additives on view will show substantial progress in the direction of a general purpose cure.

The display on thixotropic alkyds will be confined to the practical aspects of formulating, particularly the valuable characteristics which are derived from

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using thixotropic alkyds as part of the total medium. *Stand* 49.

Polimul Emulsions with Low Monomer Content

Compositions division of the *Dunlop Rubber Co. Ltd.*, Chester Road Factory, Erdington, Birmingham 24, will show a number of ways in which the range of applications of emulsions has been enlarged in the past year. The Polimul paint and adhesive type emulsions will now be available with low monomer content, enabling paints to be made with particularly good storage characteristics and freedom from the aggressive odour.

A new range of paint emulsions has been introduced which gives improved gloss without the need for elaborate formulation techniques. Panels illustrating their gloss will be shown, as well as a series illustrating deep shades made from them. This range of emulsions will, of course, be available with low monomer content.

A new emulsion which has proved useful as a water-resistant adhesive in the paper and wood working industries will be shown. Two polyacrylate emulsions have been developed for the leather trade, and in connection with these ultrasonic apparatus for assessing emulsion stability, developed at Dunlop Research Centre, will be demonstrated. *Stand* 52.

Fullers' Earth

Principal use of activated Fullers' earth is in the decolorisation and purification of oils, and filtration is an essential part of the process, state the *Fullers' Earth Union Ltd.*, Nutfield Road, Redhill, Surrey, who stress the need to supply adsorbents with favourable filter-press behaviour. Much of the company's research work is devoted to the investigation of properties which influence filtration and exhibits will illustrate how this study helps to maintain and improve product performance.

A range of absorbent clays will be shown together with bentonites finding applications of interest to the paint industry. *Stand* 34.

Geigy Start Production of Phthalocyanine Blue

The manufacture of phthalocyanine blue in this country has now been started by the *Geigy Co. Ltd.*, Rhodes, Middleton, Manchester, and they are showing colour transparencies of the plant which has been built for the purpose. It is felt that these will be of wide technical interest as they show some of the less familiar aspects of pigment production. Also shown are illustrations printed with the first standards produced. These are Irgalite fast brilliant blue BNL and Irgalite fast brilliant blue GLS.

Irgalite fast brilliant blue BNL is a general purpose phthalocyanine blue for printing ink manufacture which gives a strong clean shade. It is a pigment of the crystallising type and cannot be used in contact with aromatic solvents.

Irgalite fast brilliant blue GLS is solvent stable and gives an exceptionally bright clean shade; it is somewhat greener than Irgalite fast brilliant blue BNL. One of its main uses will be in three- and four-colour printing, but in view of its outstanding chemical resistance and light fastness it is said to be suitable for practically any application.

Geigy are also showing improvements to two existing standards, violet and victoria blue toners, which are widely used in printing inks. The improvements are in stability to nitrocellulose ink media. Up to now the use of these colours has often been ruled out because of degradation during storage of the ink. These two new standards are satisfactory in this respect. *Stand* 30.

Pigments That Need No Grinding

Golden Valley Colours Ltd., Wick, Bristol, have been concentrating on the production of pigments of extreme fineness that can be dispersed in a dispersion mill like the Kady mill or cavitation mixer (Torrance or Vickers), there being no need for grinding. The range of colours in this degree of fineness is steadily growing and the firm will cater for any pigments if the quantities are large enough.

The special process greens, lead chrome prussian blue greens, have been processed to remove all particles over 3 microns. With traditional grinding plant it is claimed that paint can be produced about six times as fast, as the pigment has only to be wetted. This is not achieved by means of surfactants, but by ensuring that there are no oversize particles. These pigments are said to have 25 per cent more staining strength and 12-15 per cent more opacity.

Skillful use of the supra red oxides enables rich crimsons and bright maroons to be produced at low cost by modifying with pigment dyestuffs. The light fastness of these oxides has not been demonstrated before and is new to the trade.

Several newcomers to the range of micronised pigments will be featured. *Stand* 17.

Adjustable Gloss Head

The new EEL adjustable gloss head, designed to operate in conjunction with the standard EEL galvanometer unit, provides a means of measuring the gloss of a sample at any desired angle over the range 15-85°. It will be shown by *Evans Electroselenium Ltd.*, Westminster Bank Chambers, Bishop's Stortford. The instrument comprises a lamp and photo-cell units, each of which are mounted with a separate pivoted lever. The lever arrangement is fitted to a stout base plate and has a light-tight cover. A recess in front accommodates a sample up to 6in. wide and a spring clip holds it firmly against the aperture.

The galvanometer is adjustable to a reading of one hundred divisions with the standard in position, after the photo-cell and lamp units have been set to the required angles. The standard is replaced by the sample and the reading noted. Price complete with standard is £85.

Also on view will be a range of EEL photo-electric instruments for the measurement of colour, gloss and particle size in the oil and colour industries. Exhibits include spectrophotometer, reflectometer, photo-extinction sedimentometer, low and high gloss heads, etc. *Stand* 38.

New Copolymer Resin by Goodyear

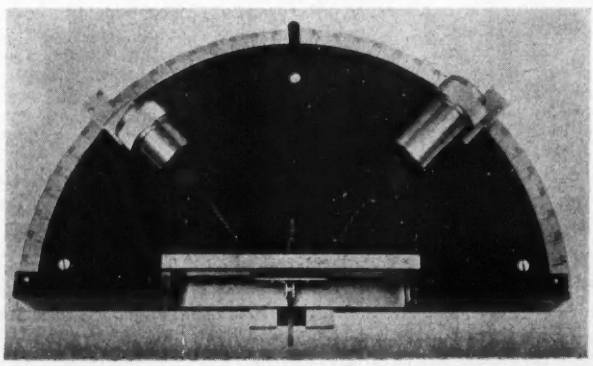
Emphasis on the stand of the *Goodyear Tyre and Rubber Co. (Great Britain) Ltd.*, Wolverhampton, will be on Pliolite S-5 and V-T, their chemical products of greatest interest to oil and colour chemists. These are two copolymer resins developed especially for the paint industry.

Pliolite V-T, a new vinyl-toluene-butadiene resin developed as a solution binder for coatings, is supplied in the form of friable granules and can be solvated by using conventional equipment. Complete solution is possible with aliphatic solvents having a Kauri butanol value as low as 36. Films which are formed by evaporation of solvent rather than oxidation show excellent clarity and are resistant to acids, alkalis and greases.

The quick-drying and film-forming properties of the new Goodyear resin suggest its use in traffic paint, paper coatings, adhesives, printing inks and related applications. Its chemical and abrasion resistance also make possible opportunities for other types of speciality coatings.

As a traffic stripe vehicle it is particularly noteworthy because it combines the properties of film toughness, chemical resistance, and ready solubility in aliphatic solvents. It dissolves in petroleum hydrocarbons with KB values as low as 36.

General film properties of Pliolite V-T bear a close resemblance to the properties of styrene-butadiene resins. It forms tough, abrasion-resistant films by simple evaporation of the solvent. These films



EEL adjustable gloss head

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have strong pigment binding and high resistance to water, oils, and chemicals.

Pliolite S-5, a styrene/butadiene resin developed as a binder for coatings, is a thermoplastic resin which is odourless, tasteless and produces films of unusual clarity, strength, hardness and chemical resistance. Films are formed by evaporation of solvent. Rate of drying depends on the solvent used. It is not an oxidising type of paint vehicle. *Stand* 13.

Viscometry as Tool of Drying Oil Research

The application of viscometry as a tool of research in the field of drying oils will be demonstrated by *John M. Hamilton and Co. Ltd.*, Humber Oil Works, Wincolmlee, Hull, with particular reference to the use of a high temperature viscometer for investigating the viscometric properties of alkyd resins, varnishes and stand oils.

A new technical information bulletin which brings together the results of the company's investigations of the properties of the processed drying oils for alkyd resin production will be available. Fresh information on alkyd oils, arising from recent research in the company's laboratories will also be displayed.

The company is drawing special attention to a selection of its products with interesting applications in the production of paints, printing inks and varnishes; these are PS.21 processed linseed oil, Epikote resin ester varnishes and 'low-odour' stand oils. *Stand* 43.

Distec Fatty Acids

The range of Distec fatty acids and hardened oils made by *Hess Products Ltd.*, 147 Kirkstall Road, Leeds 3, for the alkyd resin trade will be featured. The company will not be confining the display to these products, however, and will show all of the current commercial production range. Activities of Hess Products include splitting, distilling and fractionating fatty acids and recently they have started producing the range of Armour nitrogen derivatives of fatty acids. This range is being shown for the first time by *Armour and Co. Ltd.* and is referred to in our summary of that company's exhibits. *Stand* 72.

Resins and Plasticisers

Resins and plasticisers will be featured by *Howards of Ilford Ltd.*, Ilford, Essex. A number of ketone/formaldehyde resins will be shown and their properties and applications described. Among them will be resins from the ketones, cyclohexanone, methylcyclohexanone and methyl ethyl ketone. Work on the modification of the well-known cyclic ketone resin MS 2 has made steady progress and some of the results, especially the alcohol-soluble type for the printing ink trade, a 'reduced' MS 2 for use in artists' paints and a slightly cheaper grade with slightly inferior colour but excellent resistance to acid and alkali, will be shown.

Among the plasticisers, plasticiser IBS will be featured for the first time. It has been thoroughly tested and has been found to confer a high degree of scrub resistance, freeze/thaw stability and other valuable properties on p.v.c. emulsion paint films. *Stand* 23.

New Experimental Silicone Resins

Three new experimental silicone resins recommended as the bases of heat resistant paints are to be shown by the Nobel Division of *Imperial Chemical Industries Ltd.*, Millbank, London SW1. This division will also show applications of nitrocellulose aerosol lacquers and extra high viscosity Cellofas. Dyestuff's division is to introduce Monolite fast red YS, a new pigment of outstanding fastness properties and will indicate the wide ranges of their pigments. A new polyisocyanate for surface coatings and a new thixotropic alkyd for decorative finishes will be displayed. Solvents blended for spirit varnish applications and recent developments in the use of octylphenol as a raw material for reactive and non-reactive varnish resins will be shown by *ICI (Heavy Organic Chemicals) Ltd.*

Silicones department of ICI Nobel division state that the new resins DP.37 and DP.38 have been developed for use in the formulation of coatings for all types of surfaces. DP.37 is a flexible resin noted for its outstanding heat resistance, long heat life, colour and gloss retention at high temperatures. It is recommended for use in coloured finishes for service at 150-250°C and is of particular value in aluminium paints having good initial leafing and leaf retention for use at temperatures up to 500°C, even in the presence of the gases. It is compatible with a limited number of organic resins and may be modified with them to give improved film hardness and toughness.

DP.38 is a relatively hard resin which air-dries to a tack free film. When cured it has a fair degree of flexibility and a pencil hardness of 9H at room temperature.

DP.38 is recommended primarily for blending and is compatible with a wide range of organic resins. In the range of 25-50 per cent of total vehicle solids, it upgrades the heat resistance of organic blends very markedly.

Silicone-based paints are resistant to a number of chemical fumes, dilute acids and bases, salt solutions, oils and greases at moderate temperatures. They have only moderate resistance to solvents. Silicone paints are also claimed to be exceptionally water repellent and to give adequate protection against rusting. Surface coatings with properties intermediate between silicone-based paints and organic finishes can be obtained by blending with organic resins. *Stand* 55.

Zinc Sulphide Pigments

How the products of their associated companies, Orr's Zinc White Ltd. and Fricker's Metal and Chemical Co. Ltd. serve the paint and allied trades, will be shown by the *Imperial Smelting Corporation Ltd.*, 37 Dover Street, London W1.

The formulation of emulsion paints using Orr's zinc sulphide pigments will be illustrated with respect to hiding power, exterior durability and general appearance. Fricker's zinc oxides will be shown in gloss paints after exposure under both interior and exterior conditions. Orr's zinc tetroxychromate will be featured as an anti-corrosive priming pigment for both light metals and steel by means of exposure test panels.

A new addition to the sales range, Delaville superfine zinc dust, will be shown. This pigment is said to be outstanding for freedom from coarse particles. The range of Orr's barium chemicals will be displayed with particular emphasis on fine particle blanc fixe, a pigment for use in printing inks. *Stand* 66.

Cadmium Pigments

Attention on the stand of *Johnson, Matthey and Co. Ltd.*, 73-83 Hatton Garden, London EC1, will be drawn to the high performance of Matthey cadmium sulphide and cadmium sulphoselenide pigments in protective and decorative surface coatings.

These pigments are of particular importance in the ceramic industries where inorganic enamel and glaze vehicles are applied to the ware at very high temperatures, and in subsequent use are often exposed to very severe conditions. Since processing temperatures of organic vehicles tend to rise, the properties of these pigments must obviously assume increasing importance.

Vitreous enamels containing cadmium pigments applied on glass, pottery and iron, and processed at temperatures between 550° and 850°C, will be shown in panel form against the raw pigments, illustrating the small colour changes that occur after these high processing temperatures.

Panels will be shown which have been subjected to acid and alkali tests, demonstrating that little degradation of the pigments occurs even when the vehicles are attacked.

Heat stability is also of importance where a surface finish has to withstand high temperatures in use, and panels will be shown of pigments in silicone resin vehicles after processing at 200°-250°C, and after being subjected to 200°C for three months in air.

Advances have been made in the production of cadmium pigments equal in brilliance to the Matthey standard range but of a finer particle size. It is hoped that these pigments will be useful for the colouring of materials where dispersion presents problems. *Stand* 68.

Fluid Energy Reduction Jet Mills

The use of fluid energy reduction jet mills for the continuous dry grinding of solids, ranging from heat sensitive soft waxes to hard abrasives, down to low micron particle sizes is the theme of the stand of *Kek Ltd.*, Palmerston Street, Manchester 12. The range of Jet-O-Mizer mills represent the most recent advance in this field and the principal exhibit on the stand will be a model 0202-2 Jet-O-Mizer, the smallest mill of this type.

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Jet-O-Mizers are made by Kek Ltd. under exclusive licence from the Fluid Energy Processing and Equipment Co., US. It is claimed that these improved fluid energy mills deliver micron and submicron products of much narrower distribution range than is obtainable with other types of grinding equipment and they are successfully used for reducing hard talcs, clays, ceramics, metals, pigments, resins and many chemicals. In addition, they can achieve other functions simultaneously with fine grinding, such as dehydration of wet materials, coating of fine particles with other materials and chemical reactions. *Stand* 8.

Hot Coil Immersion Heating System

Latest of a series of developments on the direct firing of process vessels is the Kestner patent hot coil immersion heating system, designed to eliminate the difficulties caused by flame impingement and consequent degradation of the product. *Kestner Evaporator and Engineering Co. Ltd.*, 5 Grosvenor Gardens, London SW1, state that basically, only hot flue gases at a controlled temperature are used for the heating of the charge and that the system offers both rapid heating and cooling, with good temperature control.

The design of the furnace system permits the use of more than one process vessel on the same heating system, and it can be positioned, if necessary, in a completely separate area in the case of the flameproof requirements.

The Kestner Isoductive heating system, developed for the paint and allied industries, is intended for use in the electrical heating of vessels and pipelines at high efficiencies. Inherently robust, it can be supplied in standard dust- and damp-proof form or for use under flameproof conditions.

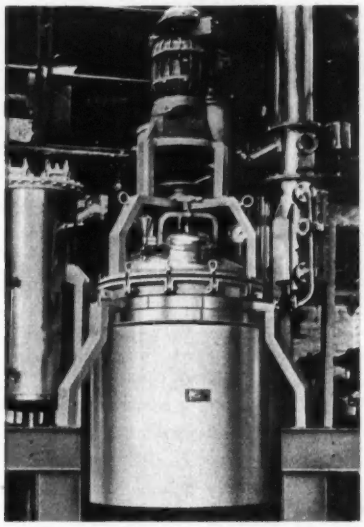
The heating equipment is of the 'built-in' type and has a 'transformer' action allied with secondary induction heating; its power factors are high and it is extremely flexible in operation. Heat is developed evenly in the actual wall of the vessel or pipeline it is required to heat, and therefore, hot spots are eliminated and lagging is much simplified. The system can be applied to either short or long lengths of heated surface, high or low input rates can be catered for, temperature control is good, and response to control requirements is immediate.

Also to be shown is a new flame-proof portable-type stirrer. The firm can offer a complete range of portable stirrers incorporating hollow, shaft-driving motors which carry a full Buxton flameproof certificate. These units, fitted with stainless steel shafts and twin three-blade propellers, are offered in sizes ranging from ½ h.p. to 1 h.p. and in three main speed ranges and are designed to handle up to 2,000 gall. of liquid, depending on viscosity. *Stand* 74.

Isopad's New Micromantle

Isopad Ltd., Barnet By-Pass, Boreham Wood, Herts, will show some of the ways in which electric surface heating can be applied in the process industries, and that their standard range of heating units, including panels, pads, jackets, mantles and tapes, can be used to apply heat to plant of almost any size or shape. Sections of an Isomantle for a 1,000-gall. process plant will be displayed.

Consisting of an insulated electric resistance element interwoven with glass



Isomantle on 100-gall. resin plant, operating in flame-proof area

or quartz fibre yarn, these pliable heaters are simply tied or clipped to the surface to be heated and then covered with lagging. Alternatively, they can be provided with a sheet-metal outer shell which makes them self-supporting and incorporates the required high-temperature lagging.

Of interest to the chemist will be the new type MIC Micromantle designed specially for semi-micro analysis, for spherical or pear-shaped flasks from 5 to 50 cc. capacity.

One of the exhibits will be a pilot plant with automatic controls for operation up to 350°C. The heaters using glass cloth are normally suitable for use up to 400°C, while the quartz cloth units can operate at temperatures up to 800°C. On special units any number of circuits, each with its own control equipment, can be arranged as required. *Stand* 9.

Peroxy Compounds

Main feature of the stand of *Laporte Chemicals Ltd.*, Kingsway, Luton, will be the range of inorganic and organic peroxy compounds for application as polymerisation initiators. Those demonstrated cover all temperature ranges of applications and types of polymerisation normally employed.

Continual investigation into the needs of manufacturers using these compounds has led to the development of newer peroxy compounds showing increased reactivity, or in a different physical form, and examples of these are to be featured.

Barium carbonate, another main product of the company, will be shown for use as a pigment extender and anti-chalk paint additive preventing acid attack. Among the inorganic peroxy compounds featured are hydrogen peroxide, sodium perborate, sodium percarbonate, sodium, potassium, and ammonium persulphates. *Stand* 34.

Organic Titanium Compounds

The range of organic titanium compounds introduced by *Laporte Titanium Ltd.*, 14 Hanover Square, London W1, during 1957 is to be shown. Those now available are: Tetra normal butyl titanate, Tetra *iso*propyl titanate and polymeric butyl titanate. Several other compounds, such as the higher esters and hydroxyl titanium stearate are under development and samples may be had on request. Some applications in the paint and allied trades will be demonstrated.

Titanium oxide pigments to be shown include Runa, Tiona and Tocarba. Technical information on them will be available. *Stand* 34.

Pilot Plant for Resins

A 10-gallon pilot resin plant will be featured on the stand of *L. A. Mitchell Ltd.*, Peter Street, Manchester. It is electric induction heated, and intended for alkyds, polyesters, epoxy and melamine resins, and other esterification reactions. Plants can also be supplied for phenol and urea formaldehyde resins.

The company will also be showing its new range of ¼ and 1/60th h.p. laboratory mixers, together with slow speed mixers fitted with turbo-type impellors. The Sparkler horizontal plate filter, including a large industrial size unit, will also be shown. It is widely used for the filtration of alkyd resins and varnishes. *Stand* 76.

Heat Exchange Media for Paint Manufacture

Display of *Monsanto Chemicals Ltd.*, Victoria Street, London SW1, will include a range of fire-resistant heat transfer media suitable for use in all chemical processes, including paint manufacture. A range of aryl silicates, TAS 10 and TAS 11, and Aroclor 1248 will be shown.

Aryl silicates, made by Monsanto and sold by Hygrotherm Engineering Ltd., and Aroclor 1248 have, the company considers, a satisfactory specific heat and thermal conductivity, freedom from fire hazard, low viscosity when cold and at operating temperatures, high boiling point and low vaporisation loss permitting operation at atmospheric pressure. Other characteristics claimed for these heat exchange media include stability to heat with sufficient margin to accommodate accidental overheating, freedom from corrosive effect on valves and lines, and from sludging.

Aroclor 1248 is said to be very stable, and capable of being heated up to 600°F in a closed system for long periods without appreciable decomposition. It can also be pumped at the lowest atmospheric temperatures likely to be encountered in

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indoor equipment. The aryl silicates will operate in a closed system without sludging or decomposition for long periods at high temperatures provided that moisture is excluded. Viscosity changes of a minor character only occur up to temperatures of 480°F for TAS 10 and 575°F for TAS 11. *Stand* 21.

Isomerised Rubber and Odourless Alkyds

Isomerised rubber will be the main feature on the stand of *Plastanol Ltd.*, Crabtree Manorway, Belvedere, Kent. A new grade, which possesses good abrasive, chemical and water resistance has, in addition, the makers state, a high compatibility with other film-forming materials, particularly short and medium oil alkyds. Because of the low viscosity of the material it should be of interest for finishes which will be subjected to severe conditions. Its possibilities as a reinforcing agent for other media are also considered promising.

Plastanol are also showing the results of work on the development of odourless and non-yellowing alkyds, carried out to study the effect of the composition of the modifying oil on film properties of alkyd resins. Initial colour retention and other developments during drying are being studied particularly. *Stand* 43.

Continuous Production of Oleines

Theme of the stand of *Price's (Bromborough) Ltd.* will be the continuation of the policy of plant modernisation at their Bromborough Pool Works.

In the earlier part of 1957 Price's opened their second Emersol plant for the production of oleines, stearines, and other fatty acids by a continuous patented process of solvent separation. Modern continuous production methods are adopted by the company. Raw materials are split in high pressure autoclaves, distilled in vacuum stills, and where necessary segregated by the Emersol process. The stand will feature this continuity by means of models of plant employed, and technologists will explain the products produced and the fields where they can be applied.

Visiting chemists may also be interested in an instrument developed in Price's own laboratory for the automatic determination of the titre/setting point of fatty acids and fatty alcohols. *Stand* 4.

Glass Climbing Film Evaporator

Main item on the stand of *QVF Ltd.*, Duke Street, Fenton, Stoke-on-Trent, will be a climbing film evaporator. This unit, which can be used as a production unit, pilot plant, or as a demonstration model for instructional purposes, is constructed in high-quality borosilicate glass, which is unaffected by practically all chemicals. Relatively high rates of heat transfer can be sustained in it, allowing many substances of poor heat stability to be concentrated without excessive decomposition. The climbing film effect is such that evaporation is conducted rapidly and the material handled is subjected to boiling temperature for only a short period.

The design has been used successfully on antibiotics, fruit juices, milk and a wide range of synthetic organic chemicals. The evaporator can be operated at either atmospheric pressure or under vacuum, as a single pass or as a recirculation unit. Using the unit single pass, it is possible to evaporate, at 26 in. of mercury and steam at 20 p.s.i. gauge, some 30 lb. per hour of water. *Stand* 6.

Dispersion Mill Demonstration

A new dispersion mill will be shown by *Premier Colloid Mills Ltd.*, Walton-on-Thames, Surrey. It is specially designed for the manufacture of all types of paint, and visitors to the stand will be able to take away small samples of paint produced on this machine and the others on display. The company maintains demonstration departments at Walton-on-Thames and at Leeds where tests can be carried out with customers' products. *Stand* 70.

Colour Concentrates for Plastics Industry

There is an increasing demand for pigments dispersed in various media and made available as colour concentrates. To meet this demand, *Reeves and Son Ltd.*, Enfield, Middlesex, have formed a technical service department to develop the formulation and use of dispersed pigments.

For the past few years the company has specialised in a range of colours to meet the requirements of the glass reinforced plastics industry, for the production of self-coloured polyester resins. A limited number of colours can be used with epoxide resins. Colour concentrates are available for the paint trade using alkyd resins.

In agreement with Scott Bader Co. Ltd., Wollaston, the company has now taken over the production of the range of Bytuco paste pigments as used for nitrocellular lacquers. *Stand* 3.

Fire-Resisting Lacquers

Rex Campbell Ltd. and the *Chemical Supply Co.*, London EC3, will share the same stand. New information on the use of methyl amyl acetate in lacquers, particularly for hot spray lacquers, airless sprays, and high-low lacquers is being given.

The fire-resisting qualities of tritolyl phosphate will also be demonstrated. A set of lacquered wood panels shows that when tritolyl phosphate is used as the sole plasticiser the films are self-extinguishing after the source of the fire has been removed. Another set of wood and hardboard panels treated with Antiflam, an organo-phosphate compound, shows their flame-proof and glow-proof qualities.

A new product on show will be epoxy plasticiser RC1. This is a high quality epoxidised soya bean oil of interest to both the paint and plastics manufacturers. A series of test pieces heat-aged at 180°C will demonstrate its efficiency as a stabiliser for p.v.c. *Stand* 7.

Acrylic Emulsions

Latest work of the *Scott Bader Laboratories* at Wollaston, Wellingborough, Northamptonshire will be demonstrated at the exhibition. Texicryl emulsions are to be shown; a range of 50 per cent solids acrylic emulsions now available in three grades, A.950 (soft), A.650 (medium) and A. 450 (hard). These emulsions are finding application in many diverse trades, and have already been accepted in the leather dressing industry where their mechanical stability and pigment binding power make them suitable for leather finishes.

In the emulsion paint field, their water resistance makes them attractive as the basis of paints for difficult conditions where polyvinyl acetate emulsions might not be suitable. They are also finding uses as materials for paper coatings and for sealing concrete floors, as well as binders for carpet backing compounds.

The emulsions have an estimated viscosity of 100-400 centipoises at the shear rate of 125.4 sec^{-1}, and an approximate weight of 10.5 lb. per gallon. The pH value is estimated as 8.0-9.5. They are miscible with each other in all proportions, and their optimum pH for stability is 9.0 which can be adjusted as desired by the addition of ammonia. It should be noted, however, that these emulsions are not stable to strong acids. *Stand* 65.

Solvent Technology by Shell

Two main groups of *Shell Chemical Co.*, 170 Piccadilly, London W1, products will be featured at the exhibition; solvents and Epikote resins.

Theme of the solvents exhibit will be the developments in solvent technology. On view will be a model of a blush assessment apparatus which is the latest development of scientists at the technical service laboratories of the company at Egham, Surrey. This apparatus, the first of its kind, has been designed to enable laboratory study of blush tendencies of nitrocellulose lacquers under conditions occurring in normal practice.

The Epikote exhibit will demonstrate the advantages of Epikote resins when used to modify other film-forming materials such as silicones, coal tar and alkyds. Epikote resin/silicon finishes have particularly good resistance to water; the Epikote resin/coal tar combinations have excellent solvent and water resistance and improved thermosetting qualities and the Epikote resin-alkyd finishes give increased alkali resistance. *Stand* 31.

Metallic Lead Pigment

The exhibit of *Spelthorne Metals Ltd.*, Batchworth Wharf, Rickmansworth, will be concerned with the use of finely divided metallic lead pigment in paints for the protection of steelwork against marine, atmospheric and chemical attack.

Results of laboratory tests on paints based on mixtures of metallic lead with other well-known inhibitive pigments will be shown, indicating that these mixtures may be of value. Previously investigation

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of anti-corrosive priming paints has been concerned mostly with those containing only a single rust-inhibitive pigment.

Pigments used in primers based on complex media such as epoxy, chlorinated rubber, oleoresinous and alkyd varnishes, and their value as the inhibitive constituent of high performance 'tailor made' and special purpose anti-corrosive priming paints will be shown. *Stand* 39.

Coumarone Resin Emulsions

Three novel developments are being shown by *United Coke and Chemicals Co. Ltd.*, a subsidiary of the United Steel Companies Ltd., at the exhibition. They are:

Aqueous coumarone resin emulsions of variable viscosity and solids content are the first. These are expected to find uses in the waterproofing of board and paper, as 'stickers' in pesticide and insecticide formulation, as dustproofing agents for masonry and concrete, and as components of water-based paints, adhesives and putties.

Also on show will be *Ulak No.* 4, a proprietary coating primarily intended for use as a primer for epoxide paints. Results obtained with this primer indicate that expensive shot-blasting operations can virtually be eliminated.

Modified coal tar pitches for use in combined pitch/epoxide coatings will be exhibited. This unusual combination results in tough, chemically-resistant coatings which should find wide use in industrial painting. One advantage of the combined coat is that coatings of up to 10-thousandths of an inch can be applied in a single coat. *Stand* 2.

High Speed Stone Mill

The problem of adequate cooling of high speed stone mills is an important factor when considering the use of this type of machine in processing various materials.

A mill which incorporates a feature to lower milling temperatures and to recover vaporised solvents is, therefore, of wide interest, and *Vickers - Armstrongs (Engineers) Ltd.*, Broadway, London SW1, will show this year details of the patented Solventite device which is used with Ultramill high speed stone mills, together with particulars of performance.

A development of the Ultramix high speed mixing machine is also to be shown in the form of a new type of turbine of patented design to give a high degree of dispersion while maintaining adequate turnover of the batch. The construction of the turbine permits a portion of the material passing through it to be subjected to more intense sheer and agitation than the main stream flowing at high velocity in a parallel direction. *Stand* 62.

Particle Size of Emulsion Paints

Vinyl Products Ltd., Butter Hill, Carshalton, Surrey, will this year feature the influence of particle size on emulsion-based surface coatings. They will also display several new development products.

The exhibit shows that the particle size of synthetic resin emulsions has a considerable effect upon the behaviour of the emulsions and their films in surface coatings. Knowledge of the size of the particles and of their size distribution helps in the understanding of differences between various emulsions.

The display points out that the particle size of fine particle size emulsions cannot be determined by phase-contrast microscopy and introduces a method relying on light transmission of highly diluted emulsions. Particle size distribution is measured by a photo-extinction sedimentometer.

Using polyvinyl acetate emulsions of widely differing particle size, the limitations of these methods are discussed. It is shown that the particle size of polyvinyl acetate emulsions is related to their pigment binding power and gloss in unpigmented and pigmented systems. *Stand* 56.

Interchangeable Laboratory Mixers

Demonstrations of the 'Easy-to-Clean' laboratory mixers are to be given on the stand of *Winkworth Machinery Ltd.*, High Street, Staines. This unit consists of a standard baseplate including self-motorised drive from a half h.p. geared motor. On it may be mounted a one-pint double 'Z' bladed mixer, either to standard specification with a cast iron pan and stainless steel blades, or of stainless steel construction, with and without jacketed pan for steam heating, or with electrical heating for operation up to 250°C including electronic temperature indicator control. A quart mixer or a 1-1½ lb. ribbon bladed blender to alternative specifications can also be fitted to the unit. *Stand* 41.

Range of Fatty Acids

Fatty acids manufacturers, *Victor Wolf Ltd.*, Victoria Works, Croft Street, Clayton, Manchester, will be exhibiting linseed fatty acids and dehydrated castor oil fatty acids, as well as their normal drying and non-drying range. A new method for increasing the heat stability of fatty acids has been developed and will be demonstrated by comparing untreated and treated fatty acids.

Dimeric acids, produced in the pilot plant at present, and which will be in bulk production during the year, will also be shown. Technical staff at the exhibition will be available to discuss these materials; under certain circumstances, the company states, it may produce material to customers' own requirements. *Stand* 50.

Linseed Oils Development

Recent advances in drying oil technology will be featured on the stand of *Younghusband, Barnes and Co. Ltd.*, Rotherhithe, London SE16. An extra pale grade of emulsifiable stand oil, for use in p.v.a. emulsions, and an extra pale grade of bleached refined linseed oil and water white linseed stand oil for use in alkyd manufacture, will be shown. 'Ybcol' (cyclopentadienated oils), 'Conjugol' (dehydrated castor oil), and an extra pale grade of enamel oil (linseed/tung stand oil) will also be exhibited. *Stand* 25.

Nitrocellulose and Terpene Resins

Although primarily plastics manufacturers, *BX Plastics Ltd.*, Chingford, London E4, operate a chemical division with large-scale plants making raw materials for conversion to plastics. The company are showing standard grades of nitrocellulose, covering the entire range for all applications. It can be supplied damped with water, methylated spirit, propanol or butanol.

Terpene resins known as Picolyte, manufactured by arrangement with the Pennsylvania Industrial Chemical Corp., will be shown. Sole selling agents in the UK are R. H. Cole and Co. *Stand* 12.

Polyisocyanate

Farbenfabriken Bayer, Leverkusen, W. Germany, have developed a new poly-*iso*cyanate, Desmodur L. In combination with Desmophen this product serves as a component for polyurethene finishes. Good results, the company state, have been obtained with Desmodur, in practical application, with an absence of health hazards. A number of new applications in protective and decorative coatings of maximum resistance based on Desmodur/Desmophen are described.

Product engineering work on unsaturated polyester resins for surface coatings, have resulted in the development of a new type, Leguval 500. It dries at ordinary temperatures without addition of auxiliaries. *Stand* 16.

Mica Anti-corrosives

The use of mica in anti-corrosive coatings for steel to resist high temperatures is to be shown on the stand of *Micafine Ltd.*, Raynesway, Derby. Also featured will be an exhibit comparing the three forms of mica—wet ground, dry ground and micronised, in emulsion paints. The results of experiments on the use of a medium based on butyl titanate polymer for this purpose, involved a zinc dust primer, and an aluminium finishing paint, will be shown. *Stand* 67.

Pigment Particles Research

The nature of pigment particles and their role in film formation will be the main theme of the *Research Association of British Paint, Colour and Varnish Manufacturers* stand.

Pigment particles used in paints vary greatly in shape and size (from 0.01 microns for the finest carbon blacks to 5 microns or more for coarse extenders). More especially the surface areas, which are really the more significant as determining the extent of potential contact with the medium, vary from 1,000 sq. metres a gramme for the finest carbon blacks down to 0.5 sq. metres a gramme for coarse extenders.

Techniques adopted at the Paint Research Station to study the effect of the pigment on the structure of the paint film will be illustrated by micrographs and models. *Stand* 57.

UK Chemical Exports and Imports for Jan. 1957 - 58

EXPORTS		QUANTITY Jan. 1957	QUANTITY Jan. 1958	VALUE Jan. 1957	VALUE Jan. 1958
				£	£
INORGANIC					
Acids	Cwt.	22,609	24,705	52,145	79,846
Copper sulphate	Tons	2,639	1,809	246,257	127,766
Sodium hydroxide	Cwt.	440,754	387,244	446,638	389,103
Sodium carbonate	,,	314,605	254,661	207,235	181,498
Aluminium oxide	Tons	2,537	2,576	81,647	90,340
Aluminium sulphate	,,	3,254	4,319	49,039	62,282
Other aluminium cpds.	,,	239	186	12,727	7,131
Ammonia	Cwt.	6,405	7,028	21,707	27,430
Ammonium cpds. (not fertilisers or bromide)	Tons	2,091	872	74,459	40,623
Arsenical compounds	,,	417	157	31,115	10,532
Bismuth compounds	Lb.	30,112	49,512	25,065	38,362
Bleaching powder (chloride of lime)	Cwt.	12,583	25,964	21,130	44,799
Hydrosulphite	,,	8,448	5,232	65,737	37,488
Other bleaching materials	,,	10,041	11,693	40,082	60,807
Calcium compounds	,,	23,207	36,121	49,406	69,631
Carbon blacks	,,	56,763	76,948	197,041	296,188
Cobalt compounds	,,	1,026	1,496	48,897	57,478
Iron oxides (chemically manufactured)	,,	8,975	4,292	26,812	13,333
Lead compounds	,,	3,498	6,332	23,063	32,372
Magnesium compounds (nes)	Tons	1,832	1,380	72,093	69,780
Nickel salts	Cwt.	6,520	5,636	62,138	61,994
Potassium compounds (not fertilisers or bromides)	,,	3,692	3,659	38,410	43,761
Sodium bicarbonate	,,	50,075	66,672	43,439	61,289
Sodium phosphates	,,	18,800	25,086	75,688	94,708
Sodium silicate	,,	28,130	23,897	24,890	21,042
Other sodium cpds.	,,	101,325	115,532	256,120	340,675
Tin oxide	,,	962	526	36,003	17,596
Zinc oxide	Tons	650	571	44,702	42,928
Inorganic chemicals (nes)		—	—	412,436	312,586
ORGANIC					
Acids, anhydrides and their salts and esters		—	—	121,260	99,898
Glycerine	Cwt.	12,151	7,339	108,983	66,807
Ethyl alcohol, etc., and mixtures of alcohols (nes)		—	—	163,234	157,330
Acetone	Cwt.	15,877	3,683	49,859	11,964
Citric acid	,,	4,259	2,582	40,575	27,501
Gases, compressed, liquid or solid (nes)		—	—	63,291	216,332
Phenol	Cwt.	12,264	19,545	79,952	119,009
Salicylates	Lb.	112,898	75,245	27,513	23,221
Sodium compounds	Cwt.	1,892	2,927	30,314	35,467
Sulphonamides, not prepared	Lb.	126,234	228,755	86,437	120,343
Dyestuffs intermediates (nes)	Cwt.	10,521	1,524	148,086	44,164
Organic compounds (nes)		—	—	1,343,732	1,391,343
Total for elements & cpds.		—	—	5,049,357	5,046,747
Coal tar	Tons	4,979	5,541	46,407	61,193
Cresylic acid	Gall.	251,115	169,594	93,587	66,074
Creosote oil	,,	2,064,022	3,886,086	139,105	285,147
Other mineral tars and crude chemicals		—	—	46,986	22,120
Pigment dyestuffs	Cwt.	2,088	3,406	81,216	110,842
Other synthetic dyestuffs	,,	17,226	15,406	753,964	630,166
Synthetic organic pigments	,,	2,001	1,323	86,329	65,044
Vegetable and animal dyeing extracts	,,	257	201	11,965	17,174
Tanning extracts (solid or liquid)	,,	12,779	6,763	56,957	27,137
Synthetic tanning materials	,,	7,038	6,472	25,619	24,320
Pigments, paints, varnishes, etc.		—	—	1,843,622	2,184,317
Drugs, medicines, etc.		—	—	2,848,263	3,410,681
Explosives		—	—	821,175	948,760
Insecticides, fungicides and rodenticides	Cwt.	32,585	19,918	383,164	310,196
Weedkillers	,,	5,644	6,054	94,063	96,488
Carbons, decolorising or activated	,,	4,460	3,567	17,934	18,242
Tetra-ethyl lead anti-knock compound	Gall.	430,079	310,310	932,809	661,520
PLASTICS MATERIALS					
Aminoplastics, solid and liquid resins		—	18,029	—	117,959
Cellulose plastics, moulding and extrusion cpds.		—	7,229	—	110,022
Phenolic and cresylic, solid and liquid resins		—	7,916	—	53,421
Other phenolic and cresylic cpds.		—	7,495	—	138,377
Polystyrene		—	21,490	—	279,353
Polyvinyl chloride, polymers and copolymers		—	11,074	—	102,367
MISCELLANEOUS					
Photographic chemicals (nes)	Cwt.	3,776	3,646	69,246	69,627
Scientific glassware	,,	1,792	1,613	94,343	88,523
Chemical and gas machinery (nes)	,,	10,295	14,338	280,171	386,401

IMPORTS		QUANTITY Jan. 1957	QUANTITY Jan. 1958	VALUE Jan. 1957	VALUE Jan. 1958
				£	£
INORGANIC					
Acids	Cwt.	7,300	10,600	21,138	32,663
Aluminium oxide—					
Crude, unground	Tons	632	1,864	31,267	101,133
Ground or graded	,,	389	414	39,461	44,665
Silicon carbide	,,	512	752	43,260	72,694
Arsenic trioxide	,,	463	450	15,587	13,587
Borax, refined	Cwt.	69,300	60,700	131,549	128,166
Calcium carbide	,,	64,971	93,053	119,908	171,746
Carbon blacks, channel	,,	17,189	20,186	93,463	108,890
Other carbon blacks	,,	10,296	9,894	38,171	33,899
Cobalt oxides	,,	591	1,140	36,941	71,285
Iodine	Lb.	221,521	33,098	85,322	12,628
Mercury	,,	268,162	53,841	299,667	49,228
Sodium, calcium, potassium, lithium, etc.	Cwt.	4,674	1	37,606	168
Potassium carbonate	,,	15,956	13,737	48,596	46,012
Other potassium cpds. (not fertilisers)	,,	9,892	6,605	42,228	31,460
Selenium	Lb.	18,959	2,897	117,769	8,361
Silicon	Tons	499	660	77,706	115,823
Sodium chlorate	Cwt.	11,790	13,889	38,851	47,082
Other sodium cpds.	,,	16,727	39,182	80,314	109,799
Inorganic chemicals (nes)		—	—	260,234	267,903
ORGANIC					
Acids, anhydrides and their salts and esters		—	—	149,626	261,658
Glycerine, crude or distilled	Cwt.	2,650	6,997	15,425	45,872
Menthol	Lb.	37,209	15,644	80,338	27,778
Naphtha, methyl alcohol and alcohols and alcohol mixtures (nes)		—	—	168,446	145,533
Turpentine	Gall.	22,773	16,048	6,992	4,774
Glycol ethers and esters	Lb.	746,865	507,287	70,643	58,194
Sodium compounds	Cwt.	13,735	8,794	132,152	93,999
Styrene	Gall.	145,737	16,416	79,130	7,764
Vinyl acetate	Tons	608	1,090	72,156	127,823
Dyestuffs intermediates	Cwt.	1,452	1,054	152,010	76,318
Organic compounds (nes)		—	—	837,192	1,436,718
Synthetic organic dyestuffs and compounds	Cwt.	3,983	2,905	324,442	277,836
Titanium dioxide	,,	4,076	92	42,250	1,022
Other pigments	,,	40,156	27,383	85,807	83,940
Vitamins, their salts and esters		—	—	104,698	111,032
Antibiotics, including penicillin, streptomycin and tyrocidine		—	—	146,812	207,033
Alkaloids		—	—	57,395	53,428
FERTILISERS					
Basic slag	Tons	15,243	19,852	127,819	163,542
Potassium chloride	Cwt.	1,072,785	1,164,869	926,685	980,870
Potassium sulphate	,,	35,320	34,983	36,428	35,691
Other fertilisers		—	—	148,772	357,968
PLASTICS MATERIALS					
Alkyd solid and liquid resins, solutions, emulsions and dispersions		—	8,806	—	121,948
Cellulose plastics—photographic film base		—	2,751	—	158,244
Other cellulose plastics		—	—	—	162,299
Polyvinyl chloride—polymers and copolymers		—	7,635	—	127,370
Other polyvinyl chloride cpds.		—	14,210	—	163,306
Other plastics materials		—	32,936	—	716,091
MISCELLANEOUS					
Chemical and gas machinery (nes)	Cwt.	1,378	3,937	79,287	208,586
Explosives	,,	32	25	2,225	950

EXPORTS OF ALL CHEMICALS TO PRINCIPAL MARKETS

	Jan. 1956	Jan. 1957	Jan. 1958
Ghana	293,761	434,172	395,052
Nigeria	536,512	452,909	597,292
Union of South Africa	1,211,368	871,149	1,197,015
India	1,416,109	1,382,787	1,020,674
Pakistan	445,134	141,959	412,929
Hong Kong	272,090	415,488	392,818
Australia	1,665,646	1,523,008	2,214,735
New Zealand	572,730	512,371	855,452
Canada	421,766	490,887	548,023
Jamaica	202,023	190,124	313,068
Irish Republic	636,370	470,818	540,394
Sweden	557,423	602,292	582,601
Norway	314,118	345,329	372,656
Denmark	310,439	401,580	482,857
Western Germany	463,503	644,858	726,696
Netherlands	762,712	849,363	842,309
Belgium	342,473	562,746	530,473
France	525,649	884,218	790,283
Italy	688,145	853,221	861,516
Iran	247,280	137,300	327,044
Burma	257,937	350,528	229,007
Japan	109,817	336,203	103,456
United States of America	636,527	798,585	650,671
Argentine Republic	177,116	279,151	500,419
Other foreign countries	268,794	210,678	229,072
Total for all countries	**20,165,782**	**20,738,939**	**22,733,406**

Overseas News

US DYE TECHNIQUE DEVELOPED FOR AIR POLLUTION STUDIES

A TECHNIQUE reported by workers at the Stanford Research Institute, US, is considered to solve the problem of tracking air current movements in air pollution studies. Their method is to atomise a solution of uranine dye (sodium salt of fluorescein) into an air steam, where it evaporates to produce minute, uniform particles of dye (2 to 10 microns). These dye particles can be recovered at sampling points by passing a known volume of air through a millipore filter. The dye is then washed from the filter and the concentration of the dye in solution is determined photometrically. A specially designed nozzle atomises the dye and dispenses it into the air stream.

Using the dye-tracer technique, Stanford Research claim that two men can wash the filters and determine solution concentration at the rate of 75 samples an hour. Sensitivity is stated to be good, a single 5-micron particle being sensed photometrically. Samples containing as few as 20 particles per filter can be measured with satisfactory accuracy.

Stanford Research suggest that atomising nozzles could be designed to generate larger particles—50 microns or more. As yet, also, the value of uranine dye in determining dispersion from hot stacks is not known. This will depend on the thermal stability of the dye. However, other materials known to be stable at 500°F are currently being considered.

US Chemical Investment in Argentina

Monsanto Chemical Co. of St. Louis, Missouri, and Norton Co., of Worcester, Mass., have agreed to invest $6 million for the establishment of chemical processing plants in Mendoza province, Argentina, in partnership with Argentine companies. Monsanto will bring the necessary machinery and technical aid and Carbometal SA (Argentina) will invest in the setting up of a polyvinyl chloride plant. Norton Co. will collaborate with Carbometal in setting up a carbon silicate and aluminium oxide plant.

Italo-Hungarian Agreement Will Include Chemicals

Under a protocol to the Italo-Hungarian trade agreement and a new payments agreement signed in Rome recently, Italy will export to Hungary among other miscellaneous chemical products, sulphur, raw asbestos, mercury, caustic soda and sodium carbonate, copper sulphate, titanium dioxide, urea, nitrogen fertilisers, tartaric acid, pharmaceutical raw materials, pharmaceutical products and medicinal specialities and antibiotics, organic synthetic dyes, naphthols, salts, intermediate bases and products for dyes, and essential oils.

Hungarian exports to Italy will include miscellaneous chemical products and essential oils.

West Indian Chemical Trade

Imports of chemicals into Jamaica, Bahamas, Bermuda and British Honduras during the first 10 months of 1957 were valued at £4,097,996 compared with £3,775,182 for the first 10 months of 1956. For the same periods exports of chemicals were £385,828 and £423,697.

Polythene Plant for Cubatão

Union Carbide do Brasil has opened its new plant in Cubatão for the production of polythene, using the by-products of the Cubatão refinery. Investment in the plant, which is the first of its kind in Latin America, was US $7.5 million. Production will be about 4,500 tons of polythene a year.

Chemical Plants Opened in Italy Last Year

During 1958 the following new chemical plants came on stream in Italy: sulphuric acid, at Porto Marghera and Varedo; synthetic ammonia, at Porto Marghera and Brescia; gasification of fuel oil, at Nera Montoro; soda, chlorine, hydrochloric acid, etc., at Mantua; polystyrol, at Mantua; maleic anhydride, at Segni; industrial phosphates, at Seregno and Porto Marghera; phosphites, at Bologna; *iso*butylic alcohol and *iso*butyl acetate, at Ferrara; polypropylene, at Ferrara. Other plants included three for the production of synthetic detergents and various plants for the manufacture of bromide and its derivatives, tartaric acid, carboxylmethylcellulose, etc.

Coenzyme A Identified

Coenzyme A, known to provide a link rôle in carbohydrate and fat metabolism and in the enzymatic process acetylation, has been identified by Dr. William McMurray, a University of Wisconsin enzyme chemist (*J. Amer. Chem. Soc.*, 1958, January issue). Dr. McMurray is a project associate of the University's Institute for Enzyme Research and is a member of a research team directed by Professor Henry A. Lardy. This new finding, reports Professor Lardy, shows at long last that there is a coenzyme in the energy-capturing systems of cells. 'It may be the first step in reconstituting the whole phosphorylation system in the laboratory'.

The Wisconsin biochemists note that the phosphorylation process, which coenzyme A helps to carry out, results in the formation of adenosine triphosphate (ATP). The process occurs in the mitochondria. Within each mitochondrion are several identical assembly lines of organic machinery. To isolate an assembly line for further study, Dr. McMurray shattered the mitochondria with ultra-sonic oscillations. It was found that oxidative phosphorylation continued but was at a much lower efficiency. Coenzyme A raised the lowered efficiency.

ICA Grants to Turkey for Purchase of Chemicals

Under economic assistance granted to Turkey recently by the International Co-operation Administration of the US Government, large sums will be available for the purchase of chemicals. The UK, together with other OEEC countries, has been designated as a possible source of procurement. Details are as follows:

Commodity	*Contract period*	*Terminal delivery date*	*Amount (in US dollars)*
Medicinal & pharmaceutical preparations	27/1/58–31/7/58	31/1/59	1,000,000
Industrial chemicals other than alcohol	30/1/58–31/7/58	31/1/59	108,000
(Note: this authorisation may be used only for the purchase of calcium carbide and ammonium chloride.)			
Chemicals & chemical preparations (excluding alcohol, fertilisers and fertiliser materials, synthetic rubber & toilet preparations)	30/1/58–31/7/58	31/1/59	1,700,000
Chemicals & chemical preparations (excluding alcohol, fertilisers & fertiliser materials, synthetic rubber & toilet preparations)	30/1/58–31/7/58	31/1/59	2,385,000
(Note: This authorisation may not be used for the purchase of dyestuffs.)			

Potash and Caustic Factory

Companhia Nacional de Alcalis has opened a factory at Cabo Frio, State of Rio de Janeiro, Brazil, for the manufacture of potash and caustic soda.

Australian Customs By-Laws Revised

After amendments to Australian customs by-laws, the following may now be admitted duty free under the British preferential tariff: Diphenylpyraline and edrophonium chloride. Synthetic vitamin A tablets will be subject to the British preferential rate of 3s 4d per 1,000 tablets, or 10 per cent *ad valorem*, whichever rate returns the lower duty.

Consultants Bureau Get Rights to Russian Journals

Exclusive world-wide rights to translate and publish complete English language editions of 20 Soviet scientific and technical journals have been granted to Consultants Bureau, Inc., 227 West 17th Street, New York 11, US, under the terms of an agreement reached last week with Mezhdunarodnaya Kniga, Soviet publications export agency. Journals covered by the agreement include Soviet publications in physics, chemistry, electronics, metallurgy and biology and medicine.

The new agreement will, it is claimed, make it possible for the publisher to shorten the time interval between date of

publication of the original journal and of the translated edition, through expedited receipt of the material for translation.

No increase in price of the translated journal will be necessary.

Consultants Bureau have committed themselves to publication of the following journals in translation for 1958: *Biochemistry; Bulletin of Experimental Biology and Medicine; Proceedings of the Academy of Sciences, USSR; Journal of General Chemistry; Journal of Analytical Chemistry; Journal of Applied Chemistry; Chemistry Section of the Bulletin of the Academy of Sciences, USSR; Automation and Remote Control; Colloid Journal; Metallurgist; Microbiology; Plant Physiology; Journal of Technical Physics; Journal of Acoustics; Pharmacology and Toxicology; Crystallography; Theory of Probability and Its Applications; Astronomical Journal; Optics and Spectroscopy; Experimental Instruments and Techniques.*

All translations are to be scheduled so that by the end of 1958, none of the translated editions will be more than six months behind the publication of the original Russian journals.

Toronto Resins Firm Acquired

Polyresins Ltd., Toronto, have become a wholly-owned subsidiary of Bate Chemical Corporation. Previously the company was jointly owned by Bate and the Borden Co., chemical division. Polyresins Ltd. will continue to supply its range of polymer emulsion products.

New US Chemicals Expected to Find Wide Industrial Use

Tennessee Products and Chemical Corporation, Nashville, Tennessee, have started commercial production of two new basic chemicals, benzoguanamine and benzonitrile, suitable for use in a wide range of plastics and in other industries. Benzoguanamine is stated to be similar in many respects to melamine and can be used in industrial finishes, plastics, paper products, adhesives, textile finishes and moulding compounds. It also has potential uses as a chemical intermediate. Benzonitrile, a basic chemical used in making benzoguanamine, can be used in many process industries, including organic synthesis, plastics, rubber, pharmaceuticals and synthetic coatings.

Italian Shortage of Calcium Cyanamide

Production of calcium cyanamide fertilisers and weedkillers in Italy has declined by 50 per cent, causing a shortage as far as the cultivation of rice is concerned. This situation is accounted for by the fact that the price which these products command in Italy does not cover the production costs.

Organic Intermediate by Union Carbide

A new chemical intermediate, 2-methyl-2-ethyl-1,3-dioxolane, claimed to be valuable as a 'blocking' agent for ketone groups in the synthesis of complex molecules, has been introduced by Union Carbide Chemicals Co., 30 East 42nd Street, New York 17.

Using this cyclic ketal to protect selected ketone groups, chemists working with complex molecules can carry out reactions at other functional sites of the molecule which would otherwise unfavourably affect the unprotected ketone groups. After modifying reactions have been completed, the blocked ketone groups can be readily regenerated.

Methyl ethyl dioxolane is known to be effective in synthesising hormones, such as testosterone and progesterone, say Union Carbide. Its chemical activity also indicates it will be useful in the preparation of many other pharmaceutical and biological chemicals, perfumes, flavouring materials, agricultural chemicals, and similar compounds. The compound's ether-like structure and stability to many reagents also suggest its possible use as a reaction medium or extraction solvent.

Natural Gas Export Policy Urged for Canada

In a brief presented to the Canadian Royal Commission on Energy, the Westcoast Transmission Co., a leading pipeline company exporting natural gas to the US, stated that unless available markets were utilised immediately under a national export policy, vast reserves of valuable gas in Western Canada would be wasted.

The opinion of this company is that Canadian gas reserves far exceed the requirements of consumers in Canada and therefore markets in the US should be secured for the surplus. Westcoast Transmission claim that unless the reserves were developed soon, other fuels would displace gas and make it superfluous and as useless as present coal resources in Alberta.

Estimated future reserves of gas in British Columbia and Alberta might be as much as 300 million cubic feet, it is stated.

Italian Plant for Canada

A large Italian industrial group has been invited to build a petrochemical plant in British Columbia. No further details are known at present.

Olin Mathieson and Cuno Form Joint Company

Olin Mathieson Chemical Corp. and Cuno Engineering Corp. have announced the formation of a jointly owned company, Olin Cuno Filter Corp. for the manufacture and sale of Micro-Klean filters outside the US.

Cuno Engineering Corp. developed Micro-Klean, a filter cartridge used in the manufacture and application of paints and enamels, operation of Diesel engines, filtration of coolants, lube and hydraulic oils and of industrial water. Cuno's new white Micro-Klean is used in the manufacture of food products and the filtration of potable water.

Worker's Health is Prime Factor in Chemical Plant Design

RESOLUTIONS on protecting workers against occupational diseases and poisoning and on industrial relations in the chemical industries were among those adopted by the chemical industries committee of the International Labour Organisation, which finished its fifth session in Geneva on 21 February. The resolution on preventing occupational diseases and poisoning, says that the health of workers should be a primary consideration in the design of premises, plant and equipment for the chemical industries. Consultation should therefore take place at the earliest possible stage between the chemist, the engineering staff and occupational health specialists, to ensure that the design in its final form is devoid of any elements which might adversely affect health.

The resolution contained various recommendations, including one saying that basic training of chemists, engineers and technicians should include instruction in safety and health. It suggests that encouragement should be given to the training of technicians in industrial hygiene and developing teaching of occupational health subjects in medical schools.

On the question of plant-level training, the resolution recommends the adoption of various measures in order that the personnel—management, medical and allied personnel, supervisors, foremen and workers—should be fully conscious of the threats to health.

It is also recommended that scientific research into all aspects of occupational health should be stimulated.

Under the heading of action to be taken at the international level, the resolution invites the governing body of ILO to keep its list of dangerous substances up to date and to continue preparing basic information to appear on warning labels for containers of dangerous substances.

The resolution on industrial relations, which was also adopted unanimously, considers that the establishment of harmonious relations between employers and workers in the chemical industries assists these industries in meeting the increased demand for their products and, in this connection, freely established and responsible trade union and employers' organisations can contribute substantially.

The committee also adopted, by 55 votes to 33, with 23 abstentions, a resolution on the protection of workers employed in atomic energy establishments. This invites the ILO to take appropriate action with a view to ensuring that the governments consult the workers' and employers' organisations regarding workers' protection and compensation in connection with atomic energy hazards, prior to the submission to the 1959 session of the international labour conference of draft conclusions on the subject.

The committee approved by 60 votes to 47, with 9 abstentions, a resolution urging the ILO governing body to note the particular importance of the question of hours of work in the chemical industries and to place the subject on the agenda of the next session of the chemical industries committee.

PEOPLE in the news

● DR. W. H. GARRETT, director of Monsanto Chemicals Ltd., has been elected president of the British Employers' Confederation in succession to SIR COLIN ANDERSON. Dr. Garrett, who joined Monsanto in 1922, and was appointed to the board in 1935, becoming director of production the same year, is vice-chairman of the Association of British Chemical Manufacturers and a life vice-president of the Association of Chemical and Allied Employers. He is a member of the grand council, Federation of British Industries; the Industrial Disputes Tribunal; the chemical engineering committee of King's College, London; and of the appointments board of Liverpool University. Dr. Garrett is also a director of Metal Industries Ltd.

● MR. JOHN D. THORNLEY has been appointed northern England representative of the fluid power division at Baldwin Instruments Ltd., Brooklands Road, Dartford, Kent. Before joining Baldwins he was commercial manager of James Holt (Engineers) Ltd. Mr. Thornley will be operating from Waterhey Cottage, Rivington, near Bolton (Horwich 364).

● DR. J. H. HAMENCE was re-elected president of the Society for Analytical Chemistry at the AGM of the society held in London on 26 February. All the other officers were also re-elected: vice-presidents, N. L. ALLPORT, R. C. CHIRNSIDE and A. A. SMALES; hon. sec., R. E. STUCKEY; hon. assistant secretary, S. A. PRICE and past-presidents serving on the council, D. W. KENT-JONES, J. R. NICHOLLS, G. TAYLOR and K. A. WILLIAMS. Ten members stood for nomination as new members of the council and six were elected. They were: R. A. CHALMERS, W. T. ELWELL, J. HASLAM, E. I. JOHNSON, G. W. C. MILNER and T. S. WEST.

● SIR JOHN HATHORN HALL, chairman of the Limmer and Trinidad Lake Asphalt Co. Ltd., is visiting Trinidad between 6 and 23 March, in connection with his company's interests in asphalt supplies taken from the famous 'Pitch' Lake.

● MR. H. SLACK, B.Sc., F.R.I.C., chief chemist in the laboratories of Associated Lead Manufacturers Ltd., Chester, retired on 28 February after nearly 37 years with the firm. Mr. Slack, who is 65 years of age, is succeeded by DR. E. H. AMSTEIN. At a dinner given in his honour on 27 February, his colleagues presented him with a clock.

● DR. C. P. MCMEEKAN, superintendent of the Ruakura Animal Research Institute, South Auckland, NZ, arrived in London last week and will be in the UK for about three months under an Underwood Fellowship of the Agricultural Research Council.

● SIR CHRISTOPHER INGOLD, F.R.S., professor of chemistry at University College, London, received the honorary degree of D.Sc. at a convocation held at Oxford University on 1 March. The public orator referred to the way in which he had used the techniques of physics to elucidate the problems of chemistry and had shown how carbon atoms are linked in rings. He also referred to Sir Christopher's work on the hexagonal formation of the benzene ring and the use that chemists have been able to make of this knowledge. Sir Christopher was knighted in the New Year Honours.

● MR. L. A. WOODHEAD, director of Cossor Instruments Ltd., is to head the Canadian mission sponsored by the Scientific Instrument Manufacturers' Association that will arrive in Toronto in mid-March. Other members are: D. A. PITMAN, sales director, Electronic Instruments Ltd.; P. SCHILLING, sales manager Stanton Instruments Ltd.; DR. V. A. SHERIDAN, director, British Physical Laboratories; D. R. STANLEY, director, Hilger and Watts Ltd.; W. H. STOREY, director, Unicam Instruments Ltd.; and J. R. WAITE, director, L. Oertling Ltd. The team will visit major industrial and scientific organisations in Toronto, Ottawa, Montreal and other important eastern Canadian centres.

● DR. A. F. ROSS, B.Sc., M.B., Ch.B., has been appointed as research liaison officer attached to Smith and Nephew Pharmaceuticals Ltd., Welwyn Garden City. Immediately before joining Smith and Nephew, Dr. Ross, who is 37, was in general practice. He was educated at Ayr Academy and Glasgow University, and in 1943 qualified with clinical prizes in midwifery and gynaecology. He was assistant lecturer in physiology at Guy's Hospital Medical School, from 1948 to 1953, during which period he gained a BMA research scholarship for work on cerebral circulation, and from 1954 until 1957 was medical officer to Sierra Leone Development Co. Ltd.

● MR. C. H. M. BAKER has been appointed to the board of directors of the Firestone Tyre and Rubber Co. Ltd. He is deputy chairman of the materials supply committee of the Rubber Manufacturing Industry, and a member of the executive committee of the Federation of British Rubber and Allied Manufacturers.

● MR. A. R. CREW, publicity manager, Monsanto Chemicals Ltd., has been elected a fellow of the Incorporated Advertising Managers' Association.

Abrac Effluent Appeal Goes to the Minister

THE decision of A. Boake Roberts and Co. Ltd., chemical manufacturers, to operate an effluent evaporation plant at their Widnes works, was the subject of complaint at the meeting of Widnes Town Council on 25 February. Councillor H. Campbell stated that the firm had been refused permission to erect an effluent evaporation plant at their factory in Dans Road. At the planning and town development committee meeting, the Town Clerk submitted a letter from the firm stating that in view of the urgency, and as a matter of economic necessity, and having no practical alternative, they proposed to operate the plant.

The company notified the Ministry of Housing and Local Government of its decision. The appeal against the council's refusal would not be heard until 21 March.

Councillor Campbell said disapproval of the action was conveyed to the company and reported to the Ministry. A letter from the company's solicitors stated that the firm felt it would not cause a nuisance by operating the effluent evaporation plant and that no harm would be done to the neighbourhood. The company would abide by the Minister's decision on the appeal.

SAC Membership Up

MEMBERSHIP of the Society for Analytical Chemistry increased by 30 in the last year and now stands at 1,900. This was reported at the society's annual general meeting held in London on 26 February. Over the past few years membership has continued to grow, 108 members in 1955, 117 in 1956 and 122 in 1957.

The ABCM-SAC joint committee on methods of analysis for trade effluents completed its work during the year, and the analytical methods trust has made a grant to support further research on an aspect arising from this work. There are now five working panels of the joint committee with the Pharmaceutical Society, actively carrying out investigations on methods of assay of crude drugs. Collaborative testing of methods of residues analysis of pesticides on foodstuffs is being carried out by the society, the Ministry of Agriculture, Fisheries and Food and the Association of British Insecticide Manufacturers. The analytical methods committee is also continually expanding its interests as demands are made by industry for methods of analysis. The SAC's first research scholar, Mr. T. T. Gorsuch, is now completing his two-year period of work at Harwell.

Obituary

MR. GEORGE ALSTON COWIE, M.A., D.Sc., Ph.D., F.R.I.C., who died at his home in Harpenden on 28 February, graduated M.A., B.Sc., at Aberdeen University. After a short period as a demonstrator in the chemical laboratory at his university, he became agricultural adviser to the potash industry. As from 1927 he became chief agricultural adviser to United Potash Co. Ltd., and in 1939 he joined Potash Ltd. in the same capacity. At the time of his death he was scientific adviser to the board of Potash Ltd.

NEW PATENTS

By permission of the Controller, HM Stationery Office, the following extracts are reproduced from the 'Official Journal (Patents)', which is available from the Patent Office (Sale Branch), 25 Southampton Buildings, Chancery Lane, London WC2, price 3s. 3d. including postage; annual subscription £8 2s.

Specifications filed in connection with the acceptances in the following list will be open to public inspection on the dates shown. Opposition to the grant of a patent on any of the applications listed may be lodged by filing patents form 12 at any time within the prescribed period.

ACCEPTANCES

Open to public inspection 2 April

Process and apparatus for the separation of gaseous mixtures. Gulf Oil Corp. **792 761**

Removing higher acetylenes from hydrocarbon mixtures. Farbenfabriken Bayer AG. **792 614**

Preparation of unsaturated higher aliphatic alcohols. Soc. Belge de L'Azote et des Produits Chimiques du Marly. **792 896**

Alkylation process for vat dyes of the dibenzanthrone series. American Cyanamid Co. **792 795**

Production of substituted iminodibenzyls. Geigy AG., J. R. **792 615**

Therapeutic compositions. Upjohn Co. **792 656**

Catalyst and process for preparing and using same. Esso Research & Engineering Co. **792 899**

Pigments. Switzer Bros., Inc. [Addition to 769 344.] **792 616**

Hexadecaheptaene compound and a process for the manufacture thereof. Hoffmann-La Roche & Co., AG., F. [Divided out of 792 593.] **792 594**

Open to public inspection on 9 April

Process for the preparation of resins. U.K. Atomic Energy Authority. **792 913**

Production of uranium and plutonium. UK Atomic Energy Authority. **792 951**

Production of uranium. UK Atomic Energy Authority. **792 952**

Production of uranium metal. UK Atomic Energy Authority. **792 953**

Process for the production of combustible gas enriched with gaseous hydrocarbons. Gas Council, West Midlands Gas Board, and Dent, F. J. **792 914**

Gasification of solid carbonaceous fuel. Gas Council, West Midlands Gas Board, and Dent, F. J. **793 035**

Refining and cracking of mineral oils. British Petroleum Co. Ltd., Collier, A. and Hyde, J. W. **793 012**

Device for mixing and dispensing a liquid mixture. Carbonic Dispenser, Inc. **792 911**

Devices for dispensing mixtures of liquids. Carbonic Dispenser, Inc. **792 912**

Processes of preparing insecticidal preparations. Naamlooze Vennootschap Philips' Gloeilampenfabrieken. **793 184**

Surface treatment of thermoplastic film. British Celanese Ltd. **793 185**

Polyamide articles and method of production thereof. Polymer Corp. **792 954**

Dialkylacetals and a process for their preparation and transformation into amino compounds. Farbwerke Hoechst AG. **793 105**

Dyeing of textile materials. Standfast Dyers & Printers Ltd. [Cognate application 7632.] **793 190**

Concentrating salt solutions by evaporation and freezing. Makano, T. **793 189**

Oxidative treatment of organic substances. Bergwerksverband zur Verwertung Von Schutzrechten der Kohlentechnik Ges. **793 192**

Process for degasifying coal. Steinmuller Ges., L. & C. **793 194**

Improving the heat-stability of branched chain polyamide resins. Beck, Koller & Co. (England) Ltd. **793 196**

Polymerisable unsaturated esters. General Electric Co. **793 047**

Oil-soluble metal containing compositions. Lubrizol Great Britain Ltd., formerly Anglamol Ltd. **793 050**

Preparation of mercurated propylurea derivatives. Barza, S. A. **792 992**

Manufacture of highly polymeric polymethylene terephthalates. Imperial Chemical Industries Ltd. **793 111**

Producing amorphous, finely-divided silica. Flemmert, G. L. **793 054**

Extracting light oil from carbonisation gas. Landa, S. **792 919**

Carboxymethylated glycol-ethers. Sandoz Ltd. **793 113**

Nitrosopyrasoles and fungicidal compositions containing them. May & Baker Ltd. **793 063**

Alkylene oxide co-polymers. Petrochemicals Ltd. **793 065**

Rust inhibitors for synthetic lubricating oils. Esso Research & Engineering Co. **793 115**

Aminoacyl anilides and related compounds. Aktiebolaget Astra: Apotekarnes Karmiska Fabriker. **793 201**

Manufacture of antimony phosphate. Associated Lead Manufacturers Ltd., and Iley, R. **792 997**

Union dyeing of acrylonitrile polymer fibre and basic nitrogenous fibre blends. Chemstrand Corp. **793 117**

Manufacture of pantothenic acid 4'-phosphate. Roche Products Ltd. **793 017**

Formation of agglomerates from powdered material. Blaw-Knox Co. **793 118**

Low temperature reduction of oxidic iron ores. Haken, K. Von, and Hahn, J. B. **792 926**

Separation of hydrogen chloride and hydrogen fluoride. National Smelting Co. Ltd. **792 927**

Preparing olefinically unsaturated chlorinated hydrocarbons. Columbia-Southern Chemical Corp. **793 205**

Hydrocarbon resin. Esso Research & Engineering Co. **793 070**

Slagging fixed bed gas-producers and the like. Minister of Fuel & Power. **793 019**

Preparing alkaline earth metal salts of oil-soluble, heat-advancing, phenolic resins. Armstrong Cork Co. **793 074**

Combination process for producing olefins from heavy oils. Esso Research & Engineering Co. **793 123**

Preparation of all-trans carotenoid compounds. Hoffmann-La Roche & Co. AG. **793 236**

Preparation of nitriles. Goodrich Co., B. F. **793 020**

Device for mixing or blending fluids or free-flowing powders. Chapman, H. E. [Cognate application 5110.] **793 021**

Hydrogenation of alkylanthraquinones. Du Pont de Nemours & Co., E. I. **793 004**

Synthetic linear polymer compositions. Du Pont de Nemours & Co., E. I. **793 132**

Streptomycin salts. Bristol Laboratories, Inc. **792 978**

Utilisation of normally poorly-combustible gas mixtures. Sulzer Freres Soc. Anon. **793 134**

Conversion of hydrocarbons containing acyclic carbon atoms. Naamlooze Vennootschap de Bataafsche Petroleum Maatschappij. **793 214**

Hydrocarbon conversion process. Naamlooze Vennootschap de Bataafsche Petroleum Maatschappij. **793 215**

Production of aromatic hydrocarbons. Naamlooze Vennootschap de Bataafsche Petroleum Maatschappij. **793 135**

Polymerisation of tetrafluorethylene. Du Pont de Nemours & Co., E. I. **793 217**

Production of mono- and disazo dyestuffs containing chromium. Badische Anilin- & Soda-Fabrik AG. **793 136**

Lubricant. Esso Research & Engineering Co. **793 137**

Apparatus for the continuous mixing and separation of two immiscible liquids of different specific gravities. Aktiebolaget Bofors. **793 025**

Hydraulic fluids. Naamlooze Vennootschap de Bataafsche Petroleum Maatschappij. **793 141**

Lubricating grease compositions. Naamlooze Vennootschap de Bataafsche Petroleum Maatschappij. **793 009** **793 092**

Copperable polyazo dyestuffs. Sandoz Ltd. **793 086**

Substituted piperidine 4-carboxylic esters. Merck & Co., Inc. **793 010**

Wet spinning of cellulose tri-esters. Celanese Corp. of America. **793 222**

Acridan derivatives. Cassella Farbwerke Mainkur AG. **793 088**

Reducing swelling capacity of synthetic alginate skins. Wolff & Co., Komm.-Ges. Auf Aktien. **792 945**

Compounding butadiene-vinyl pyridine copolymer synthetic rubbers. United States Rubber Co. **793 149**

Polymerisation of steam-cracked petroleum fractions. Esso Research & Engineering Co. **793 225**

1, 2, 5, 6-Diepoxycyclooctane. Union Carbide Corp. **793 150**

Preparing phthalic acids. Naamlooze Vennootschap de Bataafsche Petroleum Maatschappij. **793 096**

6-Dimethylamino-4 : 4-diphenyl-3-heptanoine N-Oxido and its salts. Upjohn Co. **793 226**

Phenothiazone compounds. Upjohn Co. **793 227**

Tropine benzhydril ether derivatives. Upjohn Co. **793 228**

Recovery of aromatic hydrocarbons. Esso Research & Engineering Co. **793 151**

Lubricant additives. Esso Research & Engineering Co. **793 152**

Cyclic heat regenerative conversion of liquid hydrocarbon oils into unsaturated hydrocarbons. Allied Chemical & Dye Corp. **793 153**

Polyamide powder composition. Polmer Corp. [Divided out of 792 954.] **792 955**

Manufacture of polymers of amino-acetic acid. Meggy, A. B. **793 098**

Gamma-phenoxybutyric acids and salts thereof. Shell Research Ltd. **793 230**

Esterification of isophthalic acid. Naamlooze Vennootschap de Bataafsche Petroleum Maatschappij. **793 160**

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BRITISH INDUSTRIAL SOLVENTS

(The Distillers Company Limited—Chemical Division)

Commercial News

B O Sales Growth Counters Higher Operating Expenses

SALES volumes of most British Oxygen products increased during the year at home and overseas. This growth in sales is stated to have helped to counteract the continued heavy increase in operating expenses at all stages. So states the report of the directors.

Reference was made to the preliminary statement issued by the company on group profits, for the year to 30 September last, in CHEMICAL AGE last week (p. 404).

In his statement the chairman, Mr. J. S. Hutchinson stated that British Oxygen have re-examined their programmes of capital expenditure for the next year or two and have confined these strictly to essentials to enable them to meet the continually growing demand for their products. The total as it now stands is expected to be financed from existing resources and depreciation and profit retentions.

Expansion of industrial gas sales has continued for the company's UK gas division, mainly under the influence of larger steel outputs. Production capacity is to be extended to enable the division to meet fresh requirements. Acetylene, propane, argon, nitrogen and other gases and gas mixtures have maintained their sales advance.

Chemical activities in British Oxygen Chemicals Ltd. in the Norwegian company at Odda, and in Carbide Industries Ltd., have now been brought into full co-ordination as the company's chemicals division. As a result of increased sales of melamine and polyvinyl acetate, turnover of British Oxygen Chemicals was up 40 per cent last year.

The Northern Ireland project of Carbide Industries, for manufacture of carbide and acetylene is going according to plan with site work well under way.

Mr. Hutchinson remarks that the advent of European free trade area will put a premium on the company's efficiency in the chemical field in which they specialise. Long term fuller development of their chemical investment is planned.

Overseas, a proportion of the share capital of Indian Oxygen Ltd., amounting to £500,000 was successfully offered for sale. Similar steps are on the brink of completion in respect of capital of Pakistan Oxygen Ltd. In Australia, the associate company, Commonwealth Industrial Gases Ltd., has in hand a substantial programme of extension to its manufacturing facilities including the employment of a tonnage oxygen plant at Port Kemble.

Anchor Chemical Co.

In spite of what is called the 'razor keen' competition of the export market the Anchor Chemical Co., Clayton Lane, Manchester, have trebled overseas sales in the past four years. In his annual report the chairman, Mr. Thomas Martin, says that last year the company stepped up its export sales by 28 per cent and although the home trade dropped a little the total sales were a record at just over £5,250,000.

He stated that the company's range of products was increasing as was also the number of overseas markets and they were now fully active in no less than 36 countries.

William Briggs

The directors of William Briggs and Sons, makers of bitumen products, announce the capitalisation, subject to CIC consent, of £350,000 of undistributed profits in a one-for-one scrip issue. The issue will consist of 1.4 million 5s ordinary shares.

Hilger and Watts

Confidence in the future is expressed by Mr. G. A. Whipple, chairman of Hilger and Watts Ltd. The volume of orders, he reports, is running at a high level. The company has reached the point where standardisation of component parts and planned production between the three main factories is being intensified.

Laporte Industries

Laporte Industries have acquired a majority interest in Pembina Mountain Clays of Winnipeg, which company has similar interests to the Fullers' Earth Union, a UK subsidiary of Laporte Industries.

R. B. Pullin

Electrical engineers and scientific instrument makers, R. B. Pullin and Co., report that tangible fixed assets have increased from £335,330 to £762,271. Total group trading profit was £230,116, of which £162,852 has been absorbed by taxation due to provision of a full year's tax by Aldis Brothers Ltd. against nine months' trading.

Revertex Ltd.

Manufacturers and sellers of concentrated rubber latex and synthetic resin emulsion, Revertex Ltd., report a small fall in ne profit for the year ended 30 September 1957 from £193,198 to £190,975. Commitments are £23,000 compared with £83,000 for the previous year. An increased dividend of 30 per cent is being paid as against 25 per cent in the previous year.

Triplex Group

Favourable half-year results are announced by Triplex Safety Glass group. A surplus before tax of £459,933 (unaudited figures), is reported for the six months to 31 December 1957.

Overtime was worked in nearly all departments of the safety glass factories. However, since the turn of the year there has been some slackening off in some departments for various reasons. Progress towards full recovery in its profit-earning capacity is being made by the Quickfit group.

Complete reorganisation of the whole governance of the Triplex group is being considered by the directors. It is suggested that there should be a holding company, called Triplex Holdings, with subsidiaries' production activities divided into Safety Glass, Quickfit and Engineering.

Unilever Ltd.

The combined turnover of Unilever Ltd. and Unilever NV rose by £49 million to £1,720 million, but the consolidated profit before tax fell from £98.8 million to £85.3 million in 1957, of which £43.7 million (£50.6 million) was earned in the first six months and £41.6 million (£48.2 million) in the second half. Consolidated net profit was £40.3 million in 1957 (£47.1 million). This comprised £21.1 million (£25.2 million) for Unilever Ltd., and £19.2 million (£21.9 million) for Unilever NV.

Dividends for 1957 are unchanged for the two companies. In the case of Unilever Ltd., a final dividend of 11½ per cent makes 17½ per cent for the year while Unilever NV announce a final of 10½ per cent making the total 15½ per cent.

Market Reports

Buying Interest on a Modest Scale

LONDON There has again been no outstanding feature. While new buying interest has been on a modest scale the chief industrial outlet has been taking good quantities against contracts. The call for fertilisers is about the usual for the period, and some pressure for deliveries is expected during the coming weeks. Export demand continues fairly good, with copper sulphate and a number of the soda products attracting attention. Price conditions show little change and the undertone generally remains steady. Among coal-tar products, pitch is in good request, and an active demand continues for available supplies of cresylic acid and creosote oil.

MANCHESTER Less satisfactory conditions in several branches of the textile trade have been reflected in a somewhat quieter demand for chemicals, but the movement of contract supplies to most other leading outlets seems to have been well maintained and a fair number of fresh enquiries on both home and shipping accounts have been dealt with. Prices generally continue on a steady to firm basis. Fertilisers are now moving in fair quantities with a reasonably steady demand for most tar products.

GLASGOW With prices remaining more or less on a fairly steady basis, trading generally in the Scottish heavy chemical market during the past week has shown little or no change. Conditions still are rather quiet, with quantities moderate, although for quite a varied range. A little increased activity has taken place in agricultural chemicals mostly in forward demands.

In Parliament

DSIR Work on Resistance to Insecticides

The DSIR Pest Infestation Laboratory is carrying out intensive research, using biochemical and radioactive tracer techniques, to determine the physiological factors responsible for the ability of many pests to acquire resistance to the newer chemical insecticides. This work is being done, added Mr. H. Nicholls, Parliamentary Secretary, Ministry of Labour, in collaboration with the World Health Organisation.

Anhydrous Ammonia Fertiliser Has No Advantages

Asked what steps were being taken to encourage the more extensive use of anhydrous ammonia fertiliser, Mr. John Hare, Minister of Agriculture, said that the material would be expensive to use and it appeared at present to have no advantages over the usual nitrogenous fertilisers.

UK Co-operation in OEEC Nuclear Projects

Asked what part the UK would play in the establishment of a homogeneous aqueous reactor at Winfrith Heath as contemplated by OEEC and to what extent the UK would participate in the OEEC project for a boiling water reactor at Halden, Norway, the Prime Minister said last week that no decision had yet been reached. As the UK had sufficient capacity for plutonium production, it did not seem wise to join as a full member, but we were willing to help in any way we could with advice or technical assistance.

Dumping of Radioactive Wastes Under Review

Rejecting a proposal to publish a White Paper dealing with methods of dumping radioactive wastes, the Prime Minister on Tuesday said that much information had been published. Radioactivity of wastes from the nuclear power stations was expected to be negligible, but legislation covering such releases was at present under review. This review, by the Radioactive Substances Advisory Committee, would consider whether the legislation needed to be strengthened in light of the fact that more atomic power stations will be brought into service.

Germanium Rectifier Equipment

In our reference last week (p. 395) to the newly installed BT-H germanium rectifier equipment for a chlorine plant, it was stated that the rating was 18,000 volts. The rating should have been shown as 18,400 kW, 80,000 amp, 230 volts.

ABCM Publish New 'Marking Containers'

SECOND edition of 'Marking Containers,' the ABCM manual which suggests certain general principles for the preparation of warning labels and sets out suitable wording for a number of chemical products, has now been published. The first edition was produced in August 1953 and the new edition has been completely revised, with the list of chemicals for which warning labels are recommended considerably extended to cover 331 products.

Among the more important changes to text are that only one label size is now recommended, whereas previously there were two, and that chemicals which must by law be labelled 'poison' under all circumstances and whose only hazard is toxicity by ingestion have been omitted because the statutory wording is considered to give sufficient warning. A list is also given of substances which have been considered for inclusion and rejected.

The labels recommended contain a signal word, a statement of the main hazards and precautions to be taken, and advice on action in case of accident, using a standardised format and phraseology. The ABCM council has recommended that the manual be adopted as a code of practice.

Copies of the new edition are obtainable from the Association of British Chemical Manufacturers, 86 Strand, London WC2, price 10s each ($2.50).

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TRADE NOTES

Offices of the chemical division of Armour and Co. Ltd. will be moved from 10 March to 4 Chiswell Street, Finsbury Square, London EC1 (Metropolitan 0031).

From 3 March, D. Robinson and Co. moved to Gunnersbury House, 717 London Road, Hounslow, Middlesex (Hounslow 6266-7).

Simon-Carves Mexican Contract

Simon-Carves Ltd. are to build for Du Pont SA de CV in Mexico a sulphuric acid plant with a capacity of 60 short tons of acid a day. All the equipment will be shipped from Britain in less than seven months. The order was obtained in competition with American and German firms, and the plant will be paid for in US dollars. The contract value is approximately a quarter of a million dollars.

This will be the second Simon-Carves sulphuric acid plant to be built in Mexico for the second Mexican client. A plant of 25 tons a day capacity was built about four years ago for Quimica Industrial de Monterrey SA.

Airsola Agents

The marketing of Airsola air entraining agent is now being handled in the UK and the Commonwealth by Chas. H. Windschuegl Ltd., 1 Leadenhall Street, London EC3 (one of the Amber Group of Companies) on behalf of C. L. B. Supplies Ltd.

Airsola is an additive for concrete and mortar which is claimed to ensure the complete and proper distribution of the cement throughout the mix.

Gibberellic Acid

Plant Protection Ltd., London W1, announce that they are awaiting the necessary technical information concerning the practical utility of gibberellic acid on agricultural, horticultural and flower crops. Until this information is available, they do not wish to launch the product on their sales range as they cannot yet accompany all range products with detailed recommendations as to use of the acid. Although work by the ICI industrial hygiene research laboratories has shown the chemical to be of very low toxicity, Plant Protection Ltd. state that they do not at present recommend its use on edible crops destined for sale.

In the meantime, a liquid formulation containing a concentration of 4000 p.p.m. of gibberellic acid is available from Plant Protection Ltd., without specific recommendations for use. The material is obtainable in the following sizes: 250 cc. bottle, price £6; 25 cc. bottle, price 12s.

Unplasticised PVC

BTR Industries Ltd., Herga House, Vincent Square, London SW1, have concluded a licensing agreement with Tube Turns Plastics Inc., Louisville, USA, for the manufacture in the UK of unplasticised p.v.c. pipe fittings, valves and custom moulded parts by the Hendry process. The process makes possible the production of components characterised by complete homogeneity, high density, dimensional accuracy and superior strength, and is being used in this country for the first time by a UK manufacturer.

BTP Titanium Pigment Prices Down

Price schedule of BTP titanium pigments has been revised from 1 March by British Titan Products Co. Ltd., 10 Stratton Street, London W1. Prices of the principal grades are reduced. The reductions vary from grade to grade and the new prices per ton for minimum 10 cwt. lots are: Rutiox CR and HD, £178; Rutiox SM (previously known as Rutile 272), £168; anatase LF and DM, £170; anatase E, HR and granular, £163; anatase 70 per cent, £135; anatase 50 per cent, £112; anatase 25 per cent, £85.

Quickfit Reduce Prices

Prices of a number of types of chemical glassware have been reduced by Quickfit and Quartz. The new prices are shown in their new price list. The reductions range up to as much as 30 per cent. In particular, the B 19 cone is reduced from 2s 9d plus 5 per cent and is thus near the pre-war level of 2s 3d.

These reductions have been made possible, the company states, by increased production and improved efficiency which has offset rising costs of labour and raw materials. Where demand for certain products has been small, there has been some increase in price.

DIARY DATES

MONDAY 10 MARCH

CS—Cardiff: Chemistry Dept., University College. 5.30 p.m. 'Recent studies of transient chemical intermediates' by Prof. G. Porter.

Institute of Metals—Glasgow: Institution of Engineers and Shipbuilders in Scotland, 39 Elmbank Crescent C2. 6.30 p.m. 'A metallurgist in the chemical industry' by L. Powell, followed by AGM.

TUESDAY 11 MARCH

CS & RIC—Oxford: Inorganic Chemistry Laboratory. 8.15 p.m. 'Steric hindrance in inorganic and analytical chemistry' by H. M. N. H. Irving.

SCI Chemical Engineering Group—London: 14 Belgrave Square, SW1. 5.30 p.m. 'Kachkaroff process for sulphuric acid manufacture' by F. C. Snelling and 'Constructional details of a Peters tower sulphuric acid plant' by J. P. A. Macdonald.

SCI Corrosion Group—London: Institution of Mechanical Engineers, Birdcage Walk SW1. 9.30 a.m. Symposium on the protection of motor vehicles. Until Wednesday 12 March.

WEDNESDAY 12 MARCH

I Chem E—Leeds: Chemistry Dept. Lecture Theatre, The University. 7 p.m. 'Sulphuric acid from anhydrite at Whitehaven' by A. C. Halfpenny.

THURSDAY 13 MARCH

CS—London: Burlington House, Piccadilly W1. 7.30 p.m. 'Metalloids and their compounds with the alkali metals' by Prof. W. Klemm.

RIC—London: West Ham College of Technology, Romford Road E15. 'The chemistry of synthetic fibres' by I. Goodman.

SAC Midlands Section—Nottingham: Gas Showrooms. 7 p.m. 'The analytical chemistry of synthetic detergents' by W. B. Smith.

FRIDAY 14 MARCH

CS—Birmingham: Chemistry Dept., The University. 4.30 p.m. 'Ion-pairing in strong electrolytes' by Prof. C. W. Davies.

CS—Dublin: University Chemical Laboratory, Trinity College. 7.45 p.m. 'Stereochemistry and the periodic table' by Prof. R. S. Nyholm.

RIC & SAC—Swansea: Chemistry Dept. Lecture Theatre, University College, Singleton Park. 6.30 p.m. 'Sequestration and its analytical applications' by R. L. Smith.

SCI Fine Chemical Group & London Section—London: 14 Belgrave Square SW1. 6.30 p.m. 'Research on organative compounds and their technological applications' by G. J. M. van der Kerk and E. G. Hedges.

Society of Water Treatment & Examination—London: Royal Society of Health, 90 Buckingham Palace Road SW1. 9.30 a.m. Annual meeting followed by presentation of papers. (1) 'Boiler water treatment' by P. Hamer, (2) Symposium on spectrography and chromatography, (a) 'Infra-red absorption spectrography', (b) 'U-v emission spectrography' by H. L. Bolton and P. J. Cooper, (c) 'Chromatography' by E. G. Laws, (3) 'Variations in mineral content of ground waters' by S. Buchan.

Atomic Scientists Pay Claim

Negotiations on a pay claim for some 3,000 atomic scientists and technicians have begun in London. The claim was submitted to the Atomic Energy Authority by the Institution of Professional Civil Servants a month ago.

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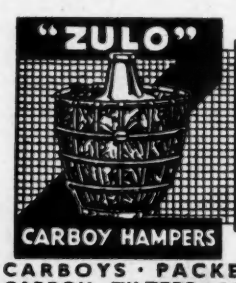

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